American Machinist

June 21, 1933

A Century of Progress

HATS OFF to Chicago and her citizens for their faith in the future and for their courage in undertaking their second world's fair in a period of economic depression! As one views the embodiment of their vision today against a background of rising prices of stocks and commodities, of increasing employment, and of restored hope, it seems like a very appropriate expression of confidence. But don't forget that the plans were made at a time when every indicator pointed downward, and that the commitments for millions in expenditures were secured when the country was suffering from aggravated economic shell shock.

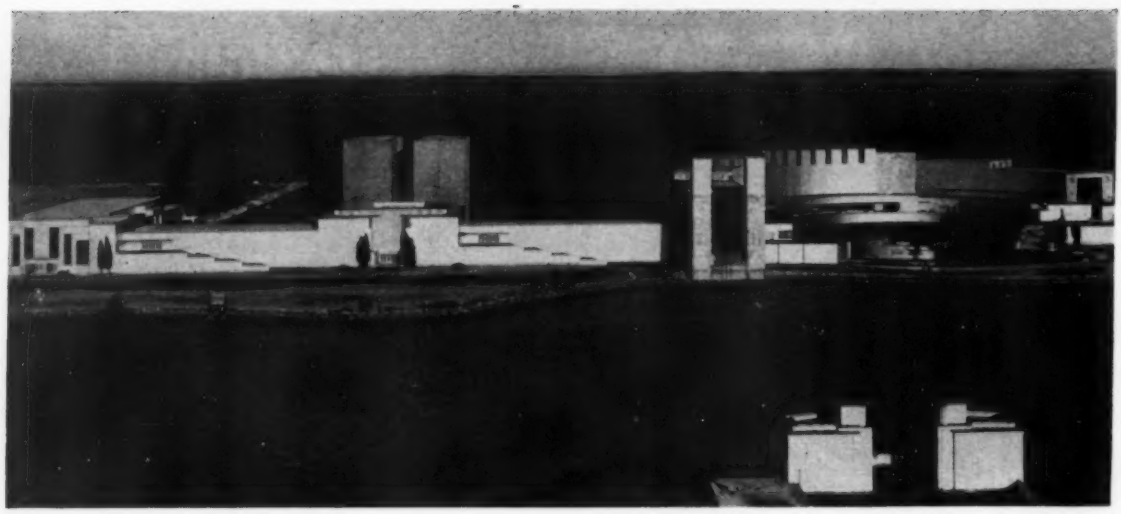
Equal credit should go to the exhibitors who had the nerve to spend the considerable sums necessary to produce the really remarkable displays to be found in every building of the fair. As I saw them, on the days immediately preceding and following the advanced official opening, many of the exhibits were not completed and a few had not even been started, but even so the effect was so inspiring that I have no hesitation in urging every reader of *American Machinist* who can take the time and find the money to spend as many days in Chicago this summer as he can.

From our point of view as workers in the metal-working industry it is a little disappointing to find so few machine tools. Of course we do not need to go to a world's fair to witness machine tools at work, but since almost every other important manufacturing process is demonstrated to the lay public by full-scale machinery or by clever models, it does seem too bad that the tools of the machine shop are absent.

Why go to A Century of Progress if there is none of our own equipment to watch? Because so many of its products in the form of machines, of scientific instruments, of metallic devices of every sort, are to be observed in action. Because new ideas spring from watching how the other fellow does things. Because the whole exhibition is built around demonstrations of pure science and of applied science. As the lecturer in the General Electric House of Magic puts it—the pure science of yesterday is the applied science of today, the pure science of today is the applied science of tomorrow.

In the following pages I shall endeavor to tell, in words and in pictures, of those parts of A Century of Progress that hold most interest for the man in the metal-working industry.

K. H. Condit



Lake Michigan provides an effective background for the massive exposition buildings

The General Lay-Out

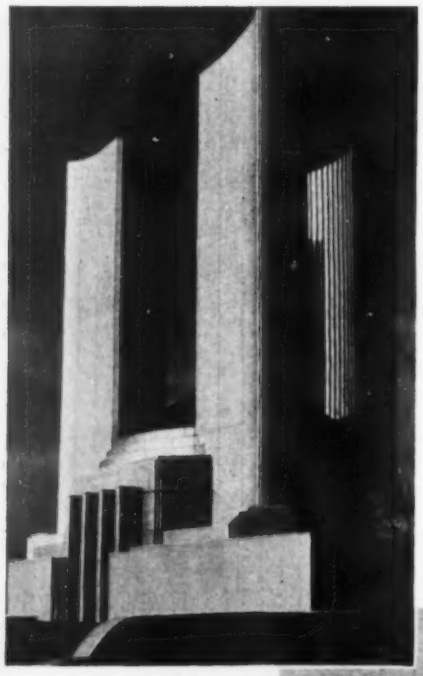
► FROM an organization point of view A Century of Progress has been extremely well handled. A large proportion of the guides, couriers and police of the grounds are college men, and their courtesy to questioners is setting a high standard. If their dispositions hold out during the whole period of the exposition, a record will have been established.

Distinctive uniforms are a convenience to the visitor and add much to the colorful nature of the spectacle. Of these the red coats, black trousers and white pith helmets of the police, and the orange running suits trimmed with blue worn by the college track team men who pull rickshas are perhaps the most striking.

Architecturally the fair strikes a new note. Geometric masses, treated in the modern manner, characterize all of the buildings. Excepting a few large reliefs, ornamentation is almost entirely lacking. In its place, and at far less cost, plain, strong color has been used with telling effect. Urban has done a masterful job.

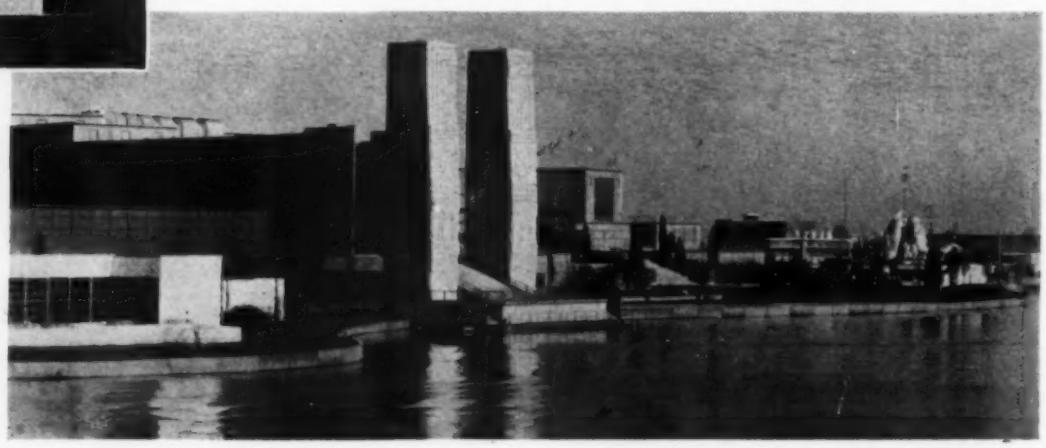
At night the effect is even more beautiful than in the daytime. On most of the structures white flood lights are adequate to bring out the strong colors of the walls, but in a few instances effects are heightened by the use of colored floods and luminous vapor tubes. Batteries of searchlights and illuminated fountains add to the general brilliant effect.

The weakest point in the structure of the fair is the food supply. In most of the eating places the food is indifferent and the service unorganized. Perhaps the arrangements will improve as the season wears on but I hate to think what would happen if a real



Striking indeed are the three pylons of the Federal Building, symbolizing the three arms of the government

Water gate of the electrical group as seen from a bridge connecting island and mainland



crowd demanded to be fed. There was a fair-sized one on Memorial Day and it cleaned out some of the places long before sunset.

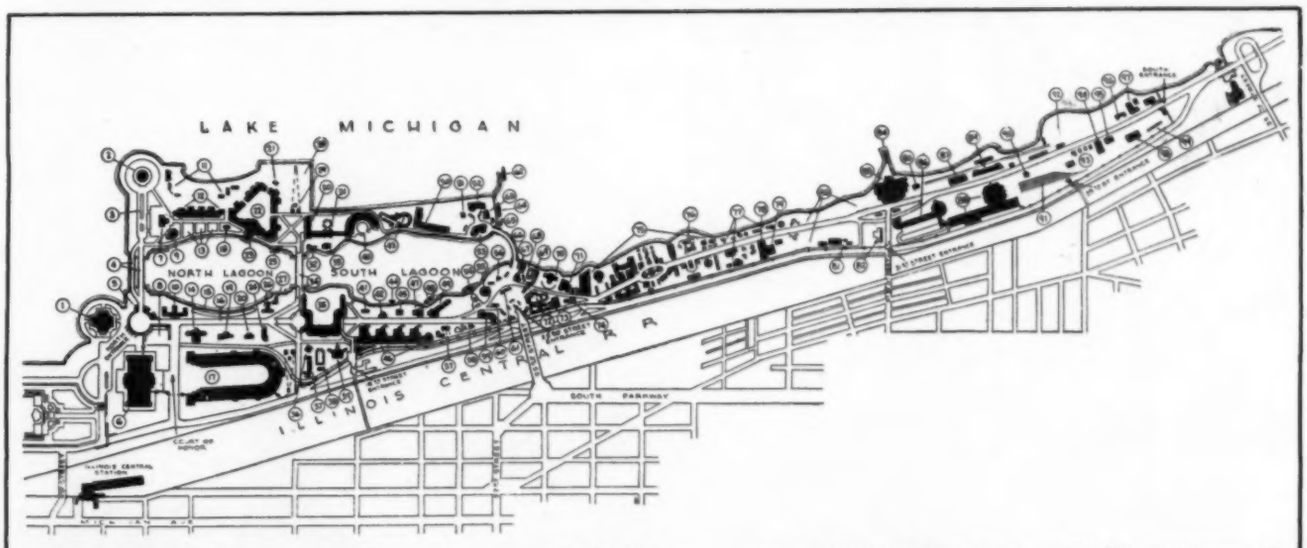
Chicago hotels have signed an agreement not to raise prices during the exposition and you can therefore get almost any sort of accommodations you want at a reasonable price. It will be wise to make reservations well ahead. There are plenty of tourist camps in the outskirts, and boarding houses all over.

No automobiles are allowed inside the exposition gates. Transportation is by bus, rolling chair or ricksha on land, by motor boat or gondola on water. Point-to-point charges by bus are a dime, round trip is a quarter. On the mainland the buses make good time along a special road that skirts the exhibits for most of its length. On the island, however, they have to take to the main thoroughfare with the pedestrians and the going is therefore pretty slow. A new road to solve this difficulty is now under consideration. Most of the travel is on foot, of course, but you should be warned that the fair is three and one-half miles long and that some advance planning is therefore desirable.

If you have three days I would suggest spending one at the south end where you will find the transportation exhibits and the General Motors and Chrysler buildings, also the model homes. Another can be put in at the Hall of Science and the general exhibits buildings, about a mile from the north gate; and a third on the island where the federal, state, agriculture, electrical and communications buildings are situated. You can spend much more time on the serious exhibits, of course. As for the midway, it's a good place to get rid of your small change, and you can find there just about any kind of entertainment that suits your fancy. On May 30 the gates to the Streets of Paris concession had to be closed after 5,000 people had jammed in at once. I leave it to your imagination what sort of show is put on there.

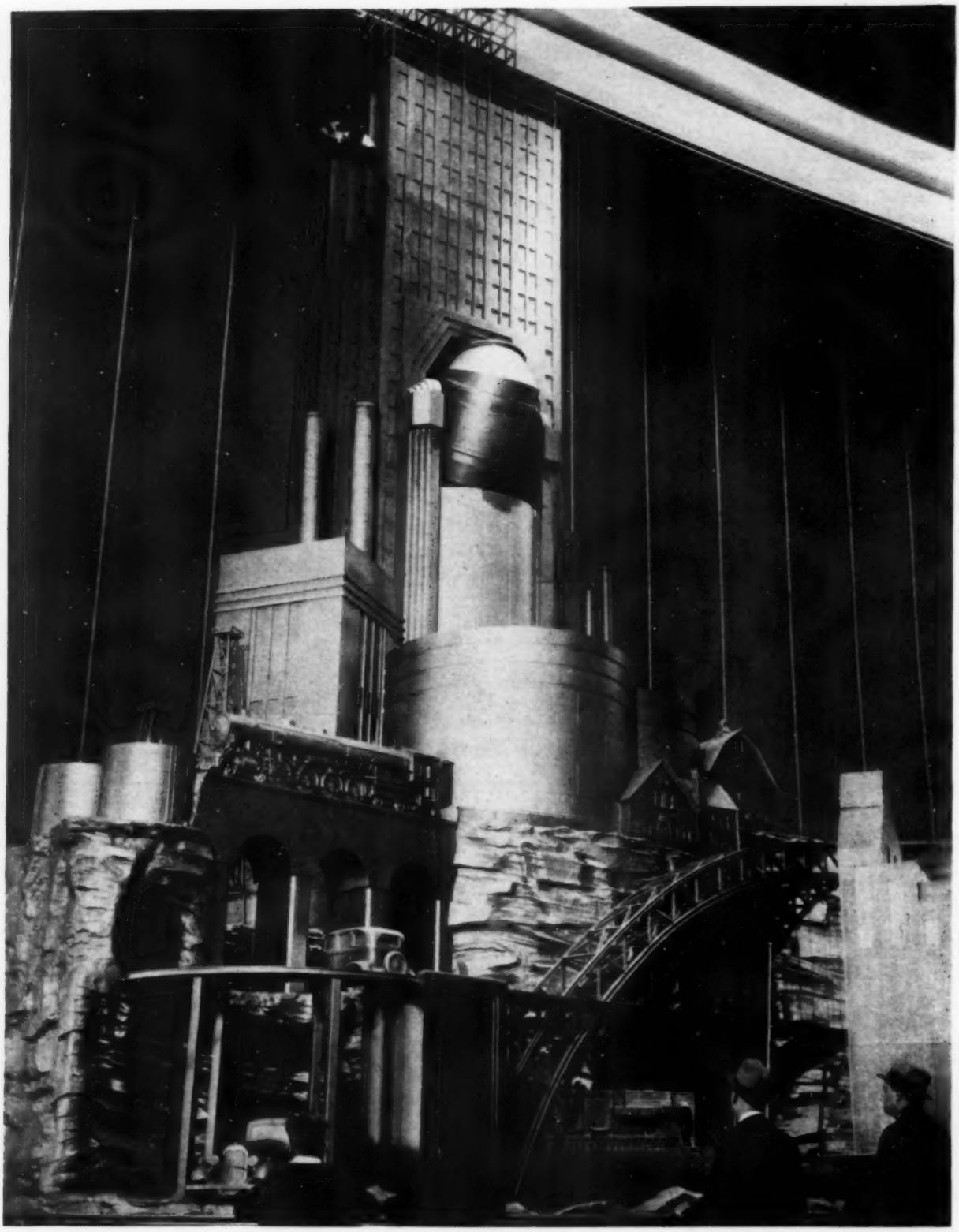
Finally, if you come to the fair from the East or South it will be worth your while spending a few days visiting the interesting factories and plants in such nearby industrial centers as Racine, Rockford, Milwaukee and Madison. All are within two or three hours' drive over state highways.

Four of the five pavilions that house the general industrial exhibits and lie just behind the Hall of Science



ALPHABETICAL KEY

Adler Planetarium..... 2
Administration Building.....10
Agricultural Group.....12
Air Show, Inc.....87
Alaska 21
Alpine Garden.....74
American Radiator & Stand. Sanitary Corp.....57
The A & P Carnival.....70
Avenue of Flags.....16
Belgian Village.....73
Bendix Lama Temple.....36
Bluenose 65
Byrd's Ship.....54
Cactus Pergola.....42
Century of Progress Club.....53
Chinese Pavilion.....30
Christian Science Monitor.....45
Chrysler Building.....88
Columbus Memorial Light.....32
Czechoslovakian Pavilion.....42
Dairy Building..... 9
Days of '49.....94
Domestic Animal Show.....95
Edison Memorial.....33
Egypt 51
Eitel's Rotisserie.....5
Electrical Building.....40
Enchanted Island.....43
Field Museum.....6
Firestone Building.....59
Florida Gardens 13
Fort Dearborn.....76
Gas Industry Hall.....79
General Cigar Company.....69
General Exhibits Group.....46
General Motors Building.....83
Goodyear Field.....82
Grand Stand.....15
Great Beyond..... 90
Greyhound Service Station..98
Hall of Religion.....49
Hall of Science..... ...35
Hall of Social Science. 39
Havoline Thermometer 56
Hollywood 52
Home & Industrial Arts Group 77
Home Planning Hall.....78
Horticultural Building.....50
The Hub—Henry C. Lytton & Sons 61
Illinois Host House.....19
Indian Village.....81
Infant Incubator.....67
Italian Pavilion.....26
Italian Restaurant.....27
Jantzen's Beach 11
Japanese Pavilion.....37
Maya Temple.....82
Midway 75
Miller High Life Fish Bar...18
Moroccan Village 72
Motor Boat Show.....44
Muller Pabst Restaurant.....47
Norwegian Ship.....64
Old Heidelberg Inn.....71
Outdoor Railway Trains.....91
Pabst Blue Ribbon Casino....53
Pageant of Transportation...89
Palwaukee Airport..... 85
Planetarium Bridges ... 4
Polish Pavilion..... ... 7
Poultry Show..... 93
Press Building..... 39
Radio & Communications Bldg. 31
Rapid Transit Terminal ... 3
Receiving Depot.....99
Schlitz Garden Restaurant. 25
Science Bridge.....34
Sears Roebuck Bldg.....14
Shedd Aquarium..... 1
Show Boat.....48
Sinclair Prehistoric Exhibit..54
Sky Ride.....29
Social Agencies & Picnic Grounds 28
Soldier Field.....17
Spoors Theatre.....63
States Building.....22
Streets of Paris.....48
Swedish Pavilion.....28
Terrazzo Promenade..... 3
31st Street Boat Landing....84
Time & Fortune Building....41
Travel & Transport Building.58
23rd Street Bridge.....86
23rd Street Steamer Landing 62
Ukranian Pavilion.....97
U. S. Army Camp.....60
U. S. Government Building 23
Waiting Corp. & Nash Motor Bldg. 80
Walgreen's Store.....60
The World A Million Years Ago 55



Dominating the first of the five pavilions given over to industrial exhibits, this sculptured presentation of the products made of steel with its unusual lighting and its tipping converter is a center of interest

Science and Industry

A Century of Progress in this day and age must of necessity record primarily progress in pure and applied science, for that is the major contribution of our times. It is but natural, therefore, that the Hall of Science is the focal point of Chicago's exposition. Assuming that the average visitor will have at least three days at his disposal it will be wise for him to spend the first one in the Hall of Science and in the nearby General Exhibits Pavilions where applied science in many industrial fields is on display.

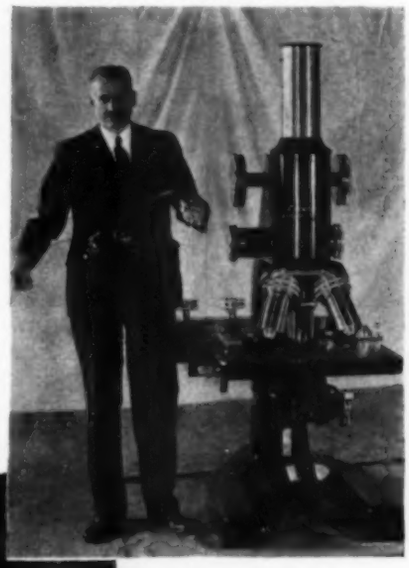
If you enter at the north gate, just back of the Field Museum, it is but a short walk down the Avenue of Flags to the Hall of Science. I would suggest entering at the upper level and going directly to the great hall. It is useless to attempt here to catalog everything in the fascinating displays in the fields of physics, chemistry, biology, geology, mathematics, etc. In the great hall, however, you will see Prof. Piccard's spherical balloon car in which he made his altitude record, and below it Dr. Beebe's bathysphere in which he made his submarine depth record. In one corner is a model of an atom, the electrons indicated by tiny winking incandescent lamps; in another a gyroscopic compass; in still another a huge section of a basswood twig that grows before your eyes.

The biology exhibits are educational and immensely interesting, from the transparent man whose "works" light up as the lecturer describes their functions, and the robot who talks about his own interior, illuminating it as he does so, to the pickled babies, or more seriously the human embryos. All this is a bit out of our field, however.

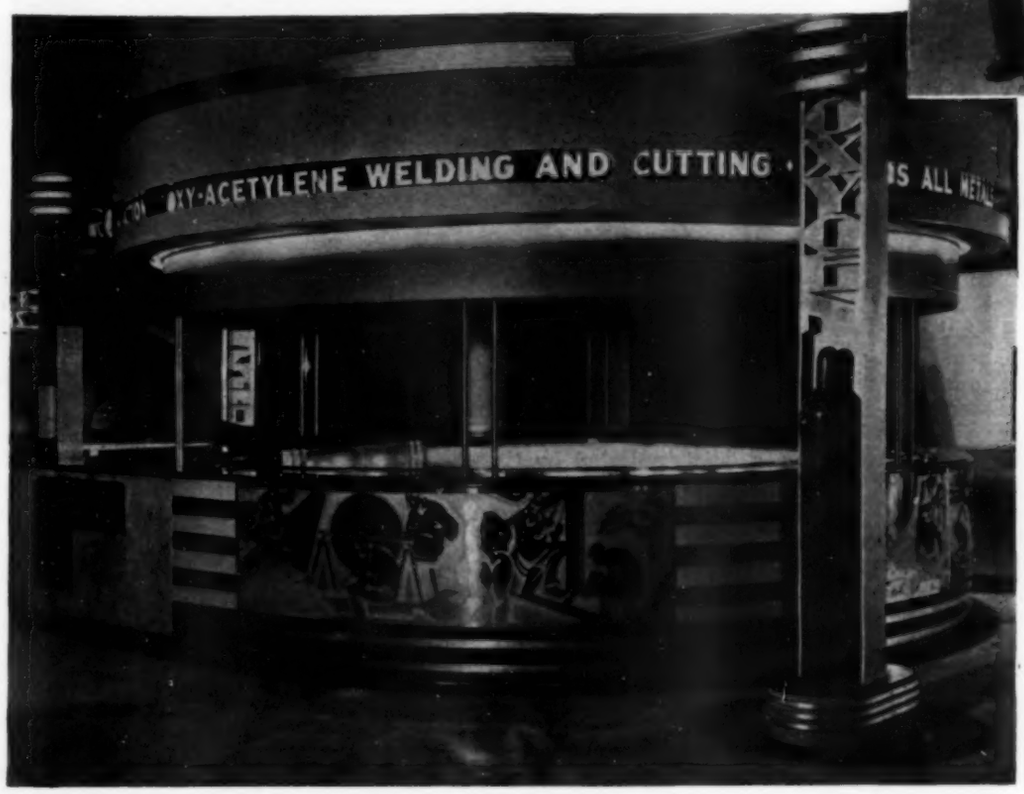
In the mathematics section you will see models of curved and warped surfaces that you may or may not have heard of in your school days, one device for tracing ellipses automatically, and another for determining the value of pi experimentally. Of particular interest is an exhibit of Johannson blocks and optical flats and a little machine that lifts a block between two flat surfaces and drops it when a small lamp warms the connection between them a few degrees and thus lengthens the distance.

Physical truths in the fields of optics, sound, dynamics and electricity, facts that are put to use daily in our industry, are explained by simple models, diagrams and experimental apparatus. Chemistry, nowadays so closely allied to physices, is explained by equally interesting devices. The thermit reaction is demonstrated, also iron burning in an oxygen atmosphere. The transformation of latex into finished rubber goods, a working model of a gold flotation plant, one of a petroleum refinery, the production of plastics, dyes and medicines from coal-tar by-products, are all worth a few minutes of anyone's time.

The geology exhibits show earth sec-



The eyes of science and industry are represented by monster eyeglasses and microscope at the Bausch & Lomb booth

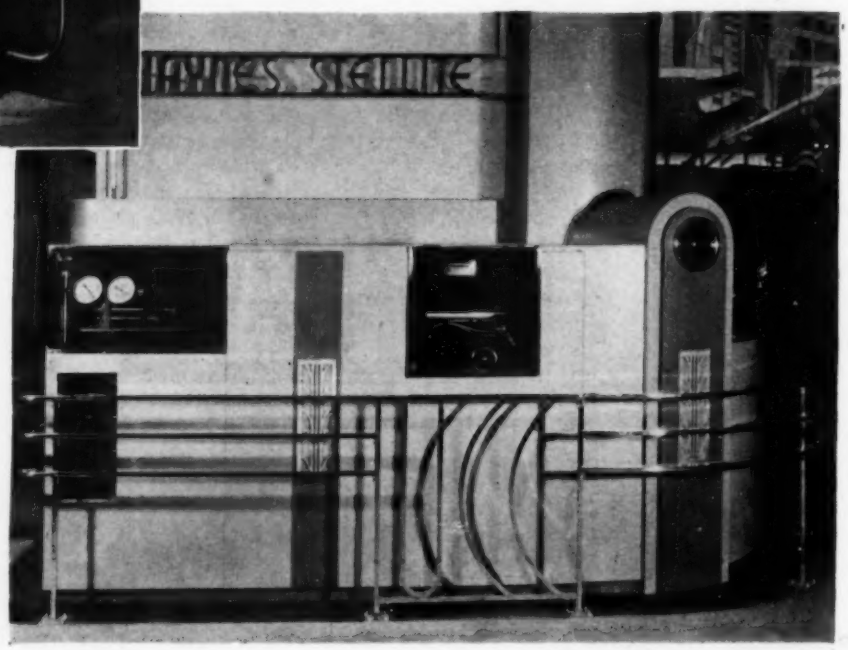


A demonstration of gas welding and cutting supplemented by motion pictures attracts the visitors at the Union Carbide and Carbon space

▼

A life-size figure beside an electric furnace and surrounded by typical alloy products is a striking feature of the Union Carbide and Carbon display

One of the few machine tools to be found is a lathe demonstrating a stellite tool cutting at red heat. Beside it is a comparative wear test on stellite



tions, prehistoric dinosaurs, dioramas of interesting geologic regions, geophysical methods of prospecting. A geological clock ticks off two billion years of the earth's history in one circuit of its dial, pictures of the various epochs appearing in the center while a phonographic record describes them.

Elsewhere on the second floor of the Hall of Science is an exhibit by the Italian government. In it are a model of Caesar's famous bridge and a section in replica of the ancient barge recently uncovered by the draining of Lake Nemi. There is also a reproduction of a ball thrust bearing believed to have been used on the vessel as a turntable for a heavy statue. The race is of wood and the balls are of bronze with integral spindles held by bronze straps. The original is at least 2,000 years old.

Many scientific instruments and displays of drugs and chemicals are on view in the commercial exhibits on the first floor. Bausch & Lomb show metallurgical microscopes and lenses of all sorts. Keuffel & Esser show surveying and measuring instruments. Union Carbide & Carbon are demonstrating gas welding in a unique depressed amphitheater; a stellite toll cutting steel at red heat, the heat being supplied by a torch; and a wear test comparing stellite with steel. They also have a small theater where liquid air experiments are performed and explained.

We have just touched the high spots of the more or less pure science exhibits but we must now move on to the applied science displays in the General Exhibits Pavilions. On the way it would be well to stop at the space of the Victor Chemical Works where there is a beatiful detailed model of a phosphoric acid plant. The first of the five pavilions is devoted to metals and minerals and is dominated by the exhibit of the United Steel Corporation. A towering sculpture occupies the center of the space. It is illustrated herewith. As will be seen, all sorts of steel products cluster about the central column which supports a converter. Periodically the room lights are dimmed and the converter tips, apparently discharging molten steel as it does so. Thereupon concealed lights illuminate the various products.

About the walls of the space occupied by this company are animated scenes showing all of the steps in the making of steel from open-pit mining to the finished product. Cases contain examples of numerous stainless steel products.

The Copper and Brass Research Association has a comprehensive exhibit of the many applications of copper and brass to industrial and home and architectural uses.

Armstrong Brothers Tool Company and the Tinius Olsen Testing Machine Company occupy adjacent booths nearby. The former company has an interesting display of toolholders and toolbits on a revolving pyramid while the latter shows a few of its many testing machines.

Just across from these exhibits the Link Belt Company shows a model car dumper, views of its plants and an obelisk on which are mounted various chain drives with a P.I.V. gear, a herringbone speed reducer, a stoker drive unit and the new Tex-Til Casing for silent chain drives at the foot.

Barrett Cravens Company has an exhibit of lift trucks and portable elevators in this pavilion. Clipper Belt Lacer is on the upper floor with a small exhibit of its products.

Pavilion 2 is devoted primarily to the graphic arts except for the Gulf Refining Company exhibit which includes miniature oil fields, a cutaway car model to show lubrication arrangements, and an airplane cockpit. You can get an excellent idea of the development in the printing art by comparing the work done by the old Gutenberg press in

the space of the Cuneo Press, Inc., with the modern units displayed by the Goss Printing Press Company near at hand.

On the second floor of this pavilion is a striking display by the Porcelain Enamel Institute. A score of users of the porcelain enamel finish show examples of their diverse products and in the center is a baking furnace in which operators bake souvenirs on which the visitor has inscribed a more or less serious message, thus demonstrating the process.

In Pavilion 3 the outstanding exhibit is that of the International Business Machines Company. Many models of various types of machines trace the development of these intricate and interesting devices from the early days. National Cash Register's exhibit gives the same sort of history of development of the accounting machine. The same may be said of Underwood-Elliott-Fisher Company's exhibit of writing and adding machines.

Moving on to Pavilion 4 we find attractive displays by the Elgin National Watch Company and the Bristol-Myers Company. I am taking the Elgin exhibit on faith because it had not been completed when I was in Chicago. It is planned, however, to show observatory methods and the machinery used in watch making. The Bristol-Myers equipment for making and filling Ipana toothpaste tubes was in full swing, however, and will stop any man who likes to see the wheels go round.

In the last of the five pavilions you can see for yourself how shirts and stockings are made by machinery. The Phoenix Hosiery Company is operating a full-fashioned hosiery knitting machine, while the Reliance Manufacturing Company is turning out work shirts.

There is one other exhibit in this general neighborhood that you will probably want to see—the Firestone Tire Company's demonstration plant making tires. I say this advisedly because I found it hard to get near enough to the machinery in this building to see what was going on. Everybody else had the same idea.

An animated model of a rolling mill is one of a dozen similar portrayals of the processes involved in steel making at the United States Steel exhibit

In one corner of the Link Belt space is a pyramid supporting typical chain drives and surrounded by other transmission units

Another of the U. S. Steel animated displays, this one a slabbing mill

Travel and Transportation

For our second day of serious sightseeing let us take in the transportation buildings and open-air shows at the south end of the fair. If you come in at the north gate it will be well to take a bus direct from there to the Transportation Building.

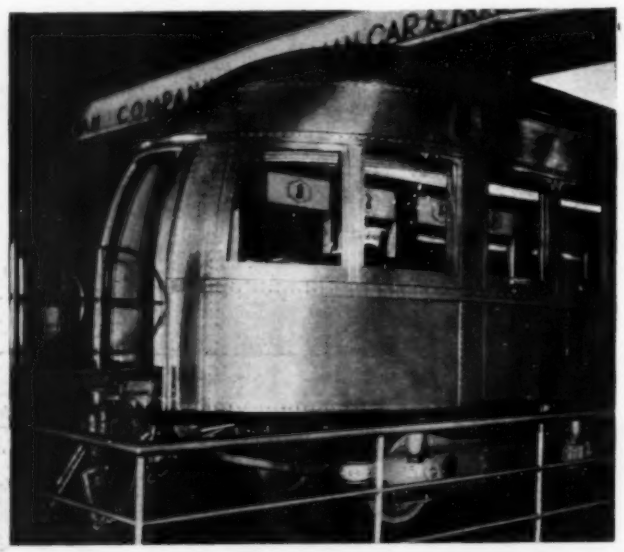
Visit the dome or rotunda first and take in the general picture of progress in transportation from the early stage coach and Conestoga wagon to the latest twin-motored transport airplane and all-aluminum Pullman. The dome itself is a curiosity because of its clear diameter of 306 ft., secured by suspending the superstructure from cables. In the center is a sort of lighthouse surmounted by the red crown of the Standard Oil Company of Indiana. In the lighthouse are four motion picture projectors that throw on screens around the building the story of transportation.

Other exhibits on the floor include the first Pullman, the old John Bull locomotive and train that operated under steam at the World's Fair in 1893, an early Curtiss pusher biplane, one of the Navy's helium container railroad cars, modern fire engine, lift truck and electric truck examples, a bus, Miss America IX, a series of Johnson outboard motors, and farm tractors of 1906 and of today.

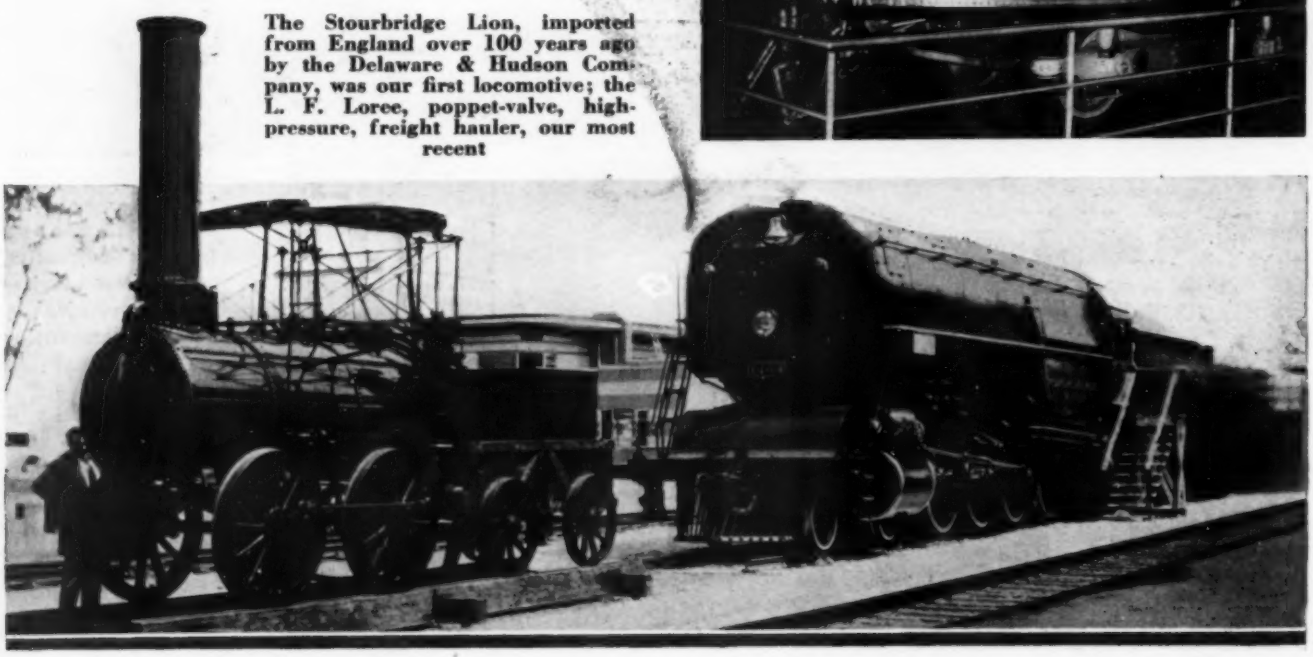
Walking out between the Pullmans into the main transportation building you will see full-size models of all sorts of railroad equipment, scale models, dioramas and illuminated maps of railroad systems. Many of the exhibitors show motion pictures as well. At the Pennsylvania R.R. space is a full-sized locomotive cab, equipped with control lights; the B. & O. has an operating model of the Atlantic locomotive of 1832, full scale, and samples of the various types of seats used in early and recent passenger cars. Illinois Central shows an illuminated globe depicting its national and international trade routes that is a masterpiece of detail. C.M.St.P.&P. has one of its huge electric locomotives so arranged that you can walk through and investigate its works.

General American Tank Car shows a milk car with Pfaudler glass-lined tanks, the famous conveyor-bottom car and a meat car. New York Central confines itself to a long scenic model of parts of its route with a moving toy train. Norfolk & Western exhibits coal mining and handling equipment to scale. Chicago & Northwestern shows its first locomotive standing in front of a diagram of its latest.

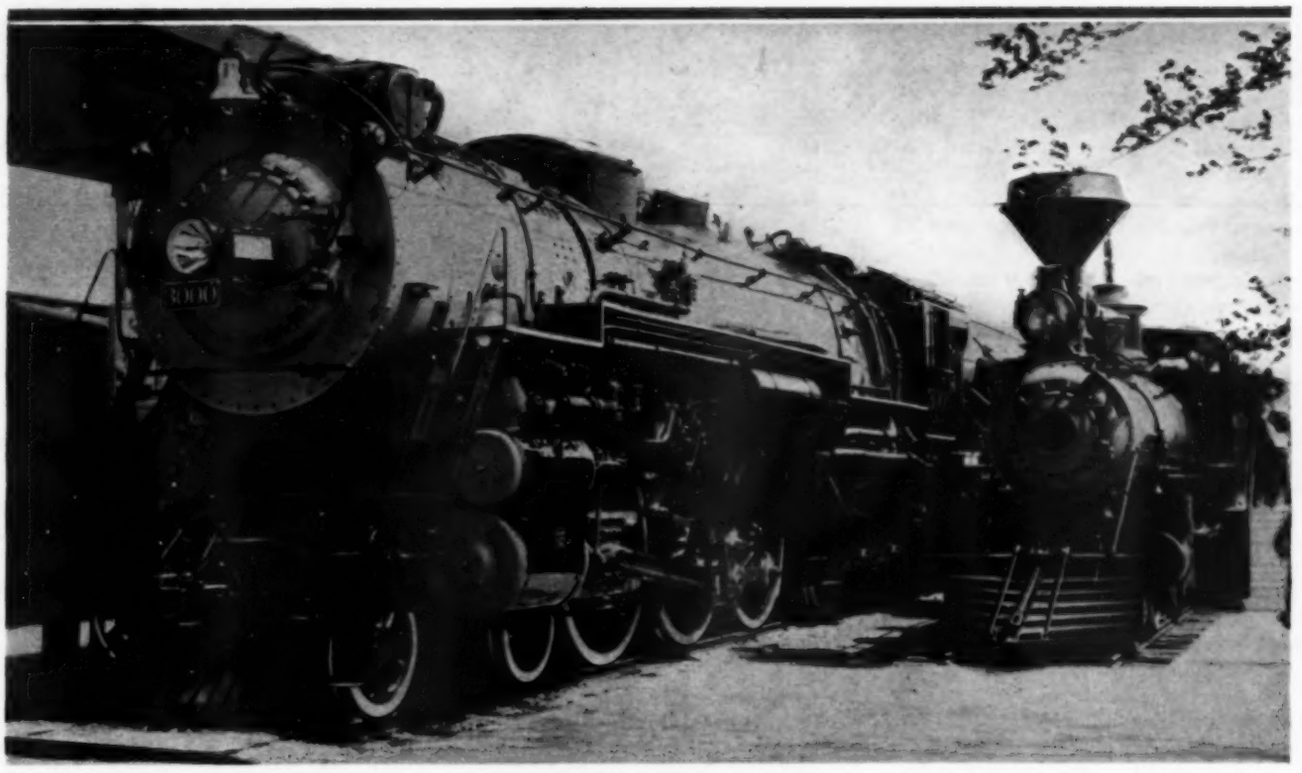
Texas Company and Alemite have interesting displays of lubrication devices for automobiles and the Cord Corporation shows airplanes, cars, engines and house heating boilers. Packard has modern cars and photographs of the early ones. The Borg-Warner exhibit houses working models of automobile transmissions, clutches and freewheeling units, also a display board of various mechanical motions. Timken shows models of bearings for transportation and industrial applications. Harnischfeger Corporation has an electric hoist and a demonstration booth where an electric welder is at work.



Rear end of one of the two new aluminum Pullmans that make up part of the modern portion of the display in the rotunda of the Transportation Building



The Stourbridge Lion, imported from England over 100 years ago by the Delaware & Hudson Company, was our first locomotive; the L. F. Loree, poppet-valve, high-pressure, freight hauler, our most recent



West of the Mississippi they used to admire the little engine at the right. Today Burlington passengers ride behind engines of the 3,000 class

Offering an interesting contrast between British and American ideas of luxurious rail travel the famous Royal Scot of the London, Midland & Scottish stands out

Otis Elevator demonstrates its high-speed escalator and thereby provides the easiest way of reaching the second floor where you will find Ahlberg Bearing with an exhibit of instruments for showing the relative frictional resistance of plain and anti-friction bearings, and for measuring eccentricity, lateral play, outside diameter, race diameter, face run-out and concentricity, width of race, bore gage and squareness, and hardness.

Outside on the display tracks are some of the crack trains of today, ancient and modern locomotives, and agricultural and construction machines. On the same track Delaware & Hudson shows the ancient Stourbridge Lion and the ultra-modern high-pressure poppet valve freight locomotive L. F. Loree. Back of it is a mine rescue car and a new type of hopper car. Next to it is one half, eight cars, and the locomotive of the Royal Scot, England's most famous and the world's fastest train. Beside it, in turn, are a section of the B.&O's air-conditioned Capitol Limited, the Burlington's most luxurious modern equipment and, quite dwarfed by comparison, an early Burlington locomotive with two cars. At the opening of the exposition the private train of the President of Mexico had not arrived but it was expected soon. Here is an unparalleled opportunity to compare early railroad equipment with that of today, and the ideas of what constitutes luxuriout travel, here and abroad.

Leaving the Transportation Group it is but a step to the Chrysler Corporation's demonstrating track and exhibit buildings. Inside the building are complete displays of what goes into the making of a modern automobile, and a set of precision tools used in manufacturing. Models of all the company's products, passenger and commercial, are shown inside, and the passenger cars are demonstrated on the track. A display table on which are spread out the 28,000 parts of a modern car is a feature. In the building there is also a motion picture theater where news reels and proving ground pictures are shown almost continuously.

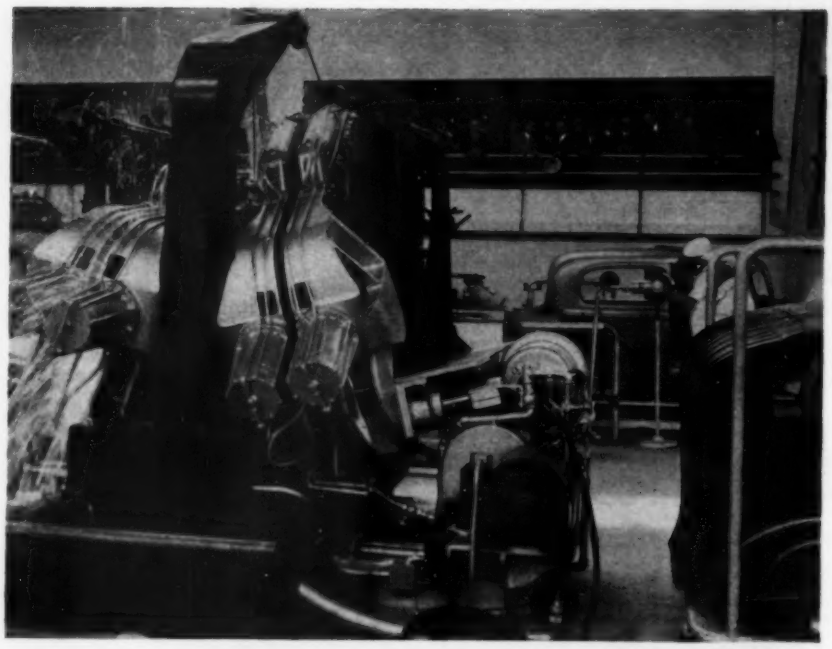
Then you walk across the highway to the General Motors building, certainly the most pretentious and apparently the

most popular exhibit of the exposition. Here you may see a complete chassis and body assembly line operating and you may even buy a car, watch it made, and drive it home as it is completed. A constant throng of visitors crowds the rail surrounding the assembly line and the press is often four and five deep.

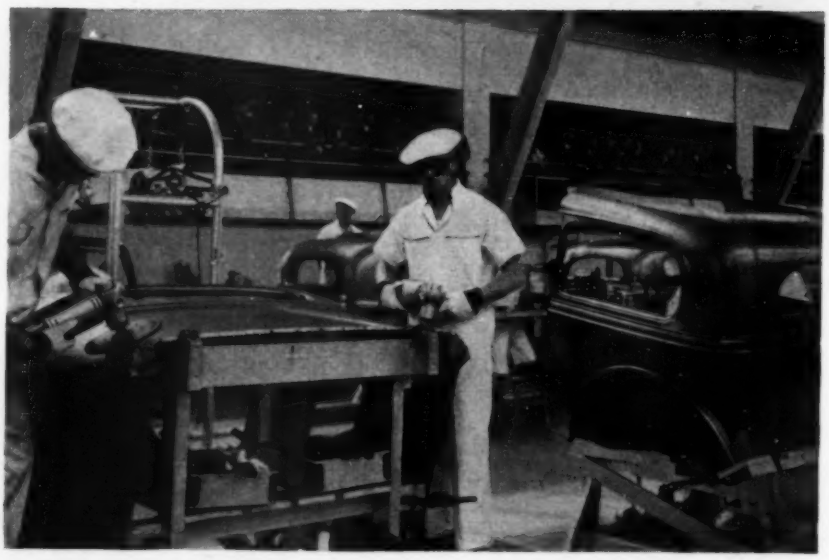
The foyer or lobby of the building is most impressive. Only two or three cars are on view in this lofty hall which is dominated by the white statue of a workman, stripped to the waist and inspecting a connecting rod held up presumably against the light. The figure is 16 ft. high and is the work of the Swedish sculptor, Carl Milles. Around the hall are six life-size carved wood figures of workers in various automotive production departments. Each is backed by a curved painting depicting his department. The six departments include: body making, foundry, forge, cylinder block, inspection, and press.

In the showroom to the left of the foyer are the exhibits of the research division including crankshaft balancing, the demonstration of the tenacity of an oil film, a model of a diesel fuel injection device, constituents of alloy steel, and apparatus to show the effect of carbon going into solution in alloy steel as the temperature is varied. Nearby are two Oldsmobiles, one an early curved-dash runabout, the other a current model. A phonograph record amplified by a loud speaker concealed beneath one of the cars reproduces a clever conversation between them in which each boasts of his "features." The cars are equipped with electric motors that operate hoods, cranks and other parts to point the conversation.

In the other showroom Fisher Body has an interesting layout of the Chevrolet body. The marquetrie or inlaid wood veneer murals in both rooms are worthy of notice, also the models of



A modern automatic body welder is a feature of the Chevrolet assembly line of the General Motors building

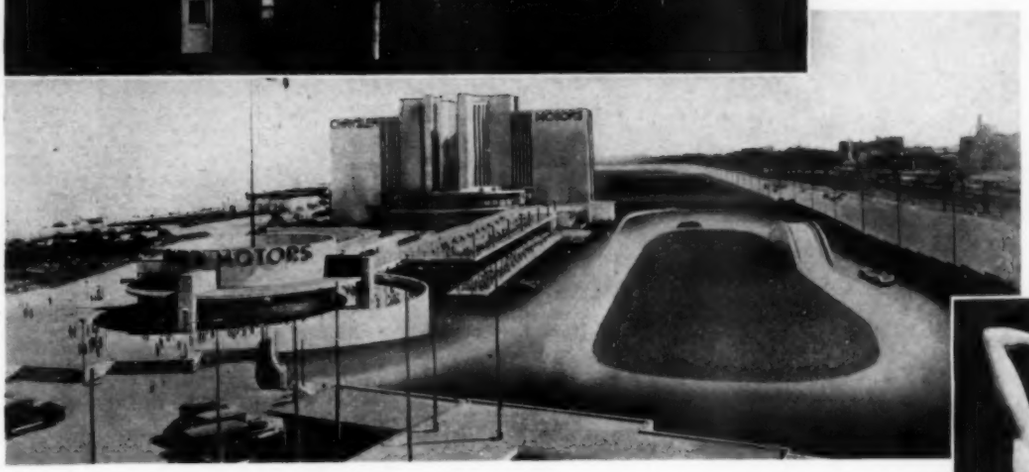


Body-finishing operations are new to many visitors and correspondingly fascinating

Chevrolet builds complete automobiles before your eyes in a hall, 90 by 420 ft., and will accept your check if you want to drive one home

The General Motors Building with its strong and contrasting colors is startlingly effective when lighted up

Chrysler includes a quarter-mile test track in its exhibit where visitors may experience the thrill of riding with famous drivers in cars built by the corporation



A 16-ft. statue in the General Motors foyer glorifies the American workman

state carriages made by boys in the Fisher craftsman contests.

The principal show, of course, is the Chevrolet assembly line which is located back of the showrooms in a space 90 by 420 ft. Welded steel arches support the roof. Behind this space is another showroom where the products of the various corporation subsidiaries, Hyatt, New Departure, Frigidaire, Delco-Remy, etc., are on display. Winton diesels occupy a separate room at one end and the truck and bus models are beneath the accessory display. A movie theater runs continuous performances somewhat like those shown in the Chrysler building.

If you like to see things move there is a concession across from the Transportation Building known as "Wings of a Century." Here you can see all the early means of transportation operated by costumed actors. Opposite it is the Whiting Corporation's parking tower, a sort of commercial Ferris wheel, used by Nash Motors to demonstrate models of its cars.

If there is still time after you have visited these features you should take in the model homes which lie a short distance north of the General Motors building. They are worth studying because of the domestic machinery installed and because of the use of steel and other metals in the fabrication. Some of the architectural ideas embodied in these structures point the way to shop fabrication on a scale hardly realized heretofore.

Located in this group is the Owens-Illinois glass brick building which isn't so startling when you actually examine it. Among the exhibits within is a model of a complete glass bottle making plant.

In its glass-brick building Owens-Illinois shows a model of a glass bottle making machine

One section of the Bell System exhibit where visitors may watch the dialing operation

Exhibits on the Island

For our third day of inspection of what science and industry have to offer let us go over to the island on which are located the electrical, communications, federal and state, agricultural and dairy buildings. You can use any one of the three bridges to get there on foot, or you can ride a bus over either of the end bridges. As you will see from the map the island is opposite the northern end of the grounds.

If you cross the central bridge from the Hall of Science you will probably turn to the right and enter the Hall of Social Science through which you can go directly to the Radio and Communications Building. The crowd stops at the telephone exhibit which takes up two floors and you will probably stop with them to watch a mammoth display showing how the dial phone mechanism works. You can also hear ordinary speech raised or lowered in pitch, or inverted so that it is completely unintelligible. You may have a free souvenir long distance conversation with any party in one of nearly a hundred cities throughout the country. You can observe the method of conducting a dozen conversations over a single pair of wires. A demonstration of the teletypewriter is also going on.

The telegraph companies both have interesting exhibits, commercial and technical. Nearby you will find R.C.A. with a radio tube manufacturing unit in operation as the principal point of interest for metal-working men.

Going on through into the Electrical Building, which adjoins, you will find a most impressive show put together by the central station industry. The focal point is a diorama, 90 ft. long, which portrays the whole process of manufacturing and distributing electrical energy. Backing this up are demonstrations of electricity at work, in the home, on the farm, in industry. You will probably make an involuntary and envious pause at the workshop of the model home, and wish you had one like it.

Electrical appliances for the office are worth looking at and you should spend a few minutes at the space showing electric heat in industry. This exhibit includes a Hevi-Duty resistance furnace, a Pittsburgh Lectromelt melting furnace, a Leeds & Northrup Hump furnace, G.E. mesh belt for feeding a hardening furnace, an A.C.F. Berwick rivet heater, a model of a G.E. enameling oven and conveyor, a photo cell controlled automatic sorting conveyor model built by G-M Laboratories and Chicago Automatic Conveyor Company, a G.E. and Bigelow electric steam generator, a Westinghouse automatic welding head and various other displays by Wiegand, I.T.E., etc. Once again I must remark that these are only high spots in a comprehensive presentation over which you might profitably spend considerable time.

On the lower floor of the semicircular Electrical Building are the main displays of General Electric and Westinghouse. Each is distinguished by its artistic treatment and the two by their harmony of design. General Electric shows a sectioned turbine, ship models and samples of its domestic electrical equipment. Its lighting division has a separate display one feature of which is a mercury vapor lighted shop. The

central point of the exhibit is the House of Magic, however. Here, every half-hour, an able lecturer describes a few of the fascinating experiments that show modern developments in scientific research. Light is made audible, sound visible, and stroboscopic effects are illustrated. The lecturer does an excellent job of making technical features simple, but even so I suspect that much of what he says goes over the heads of his average audience in the little theater.

Westinghouse also shows all of the domestic electrical equipment made in its various plants but specializes on working models of industrial applications of electricity. For instance, under a glass plate in the floor you can watch a section of a waterwheel generator rotating, while overhead is a model of a steam turbine rotor. A scale model of the Macon is also suspended above your head. A hydraulic type of governor has been so arranged that a visitor can lift his own weight by blowing on a diaphragm. Wax ingots can be rolled in a model dual-drive rolling mill. A 300-hp. synchronous motor from a rubber mill is exhibited so that the spectator can see for himself the safety feature that permits bringing it to a stop in less than a second. He can operate a mine locomotive that runs on rollers. He can see the evolution of the modern electric motor in a display of old and new models. A light-weight diesel-electric unit, a model of the President Coolidge, one of a new P.R.R. electric locomotives, are a few of the interesting things to see and play with.

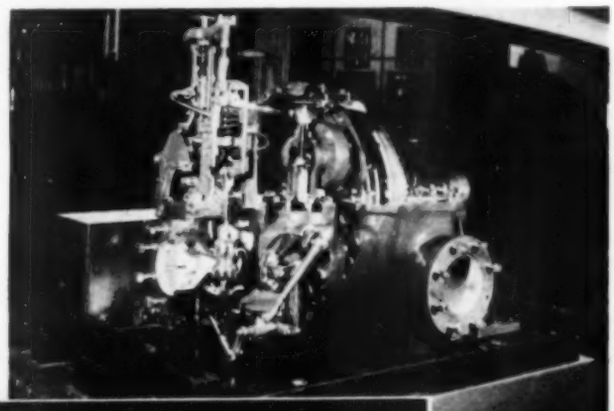
Up on the mezzanine are displays of lamp parts, a demonstration of wireless power transmission, an X-ray machine, a color-matcher, an oscilloscope, photo cells operating fire extinguishers and a screen in a bank teller's window. Again, these are but a few of the many fascinating exhibits.

Across the way Singer sewing machines are doing all sorts of interesting stunts. Nearby, Delta Manufacturing Company is demonstrating small metal- and woodworking tools. Elsewhere in the building are exhibits of all sorts of electrical appliances but those for domestic or consumer use predominate.

It is but a short walk from the electrical group to the striking Federal Building with its court of state exhibits in the rear. Here the various government departments are showing a few of the things they do to justify their existence. In the Bureau of Standards display, for example, there is a small wind tunnel that operates, and a weatherometer for accelerated paint tests, a spectroscope for analyzing six different gases, a Baldwin-Southwark hydraulic tension tester, an interferometer, apparatus for observing strains in glass specimens under polarized light.

The Patent Office shows a few models and a lot of charts. The Navy has a sectioned radial airplane engine, a torpedo, shells, ship propellers and guns. A coining press is the center of the exhibit put on by the Bureau of the Mint. Other departments also show examples of their activities.

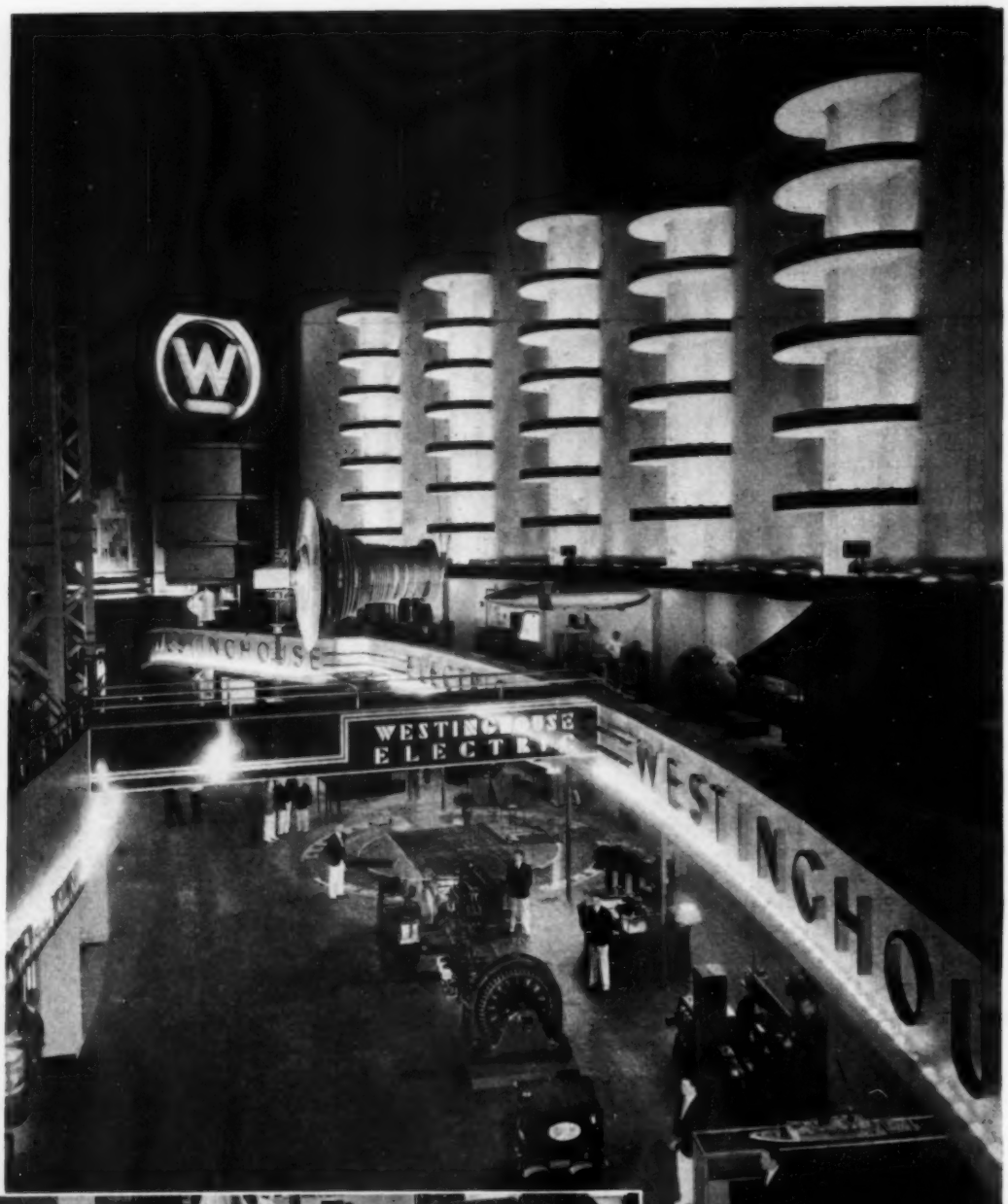
You may be surprised that I suggest spending some time in the Agricultural Building, but in it you will find some interesting machinery. At the north end International Harvester has an excellent exhibit of farm implements,



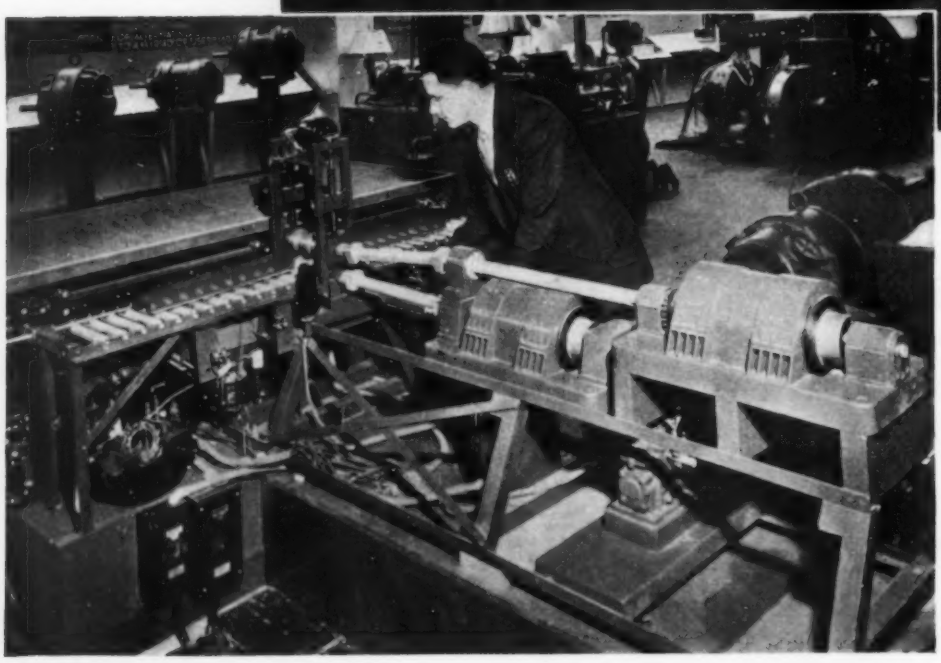
A sectioned model of a modern turbo-generator is a feature of the General Electric display

▼

In General Electric's House of Magic competent lecturers demonstrate and explain the new developments of pure science

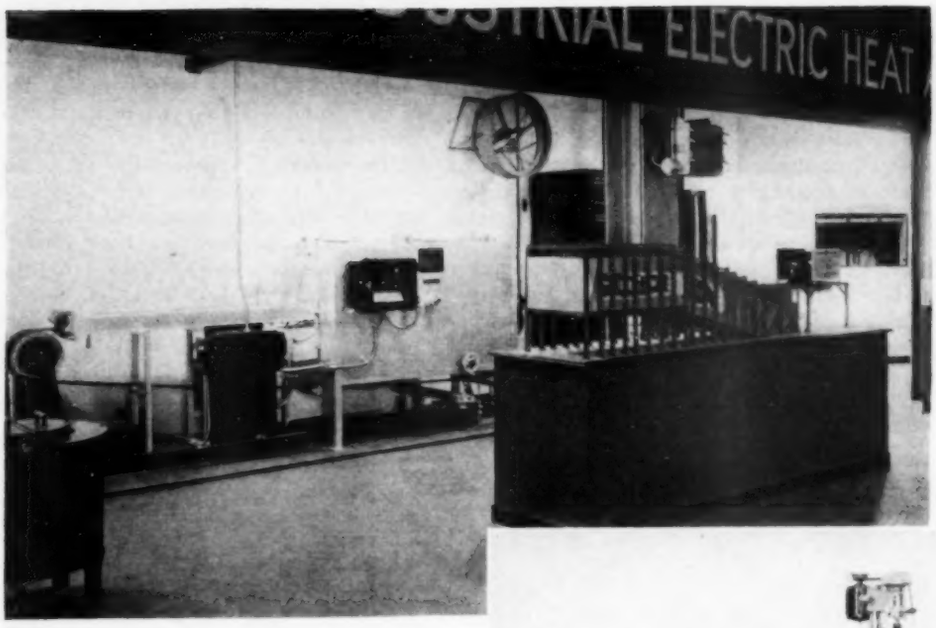


On its main floor Westinghouse displays electrical products for industry and for the consumer. On the balcony all sorts of electrical demonstrations can be operated by the sightseer



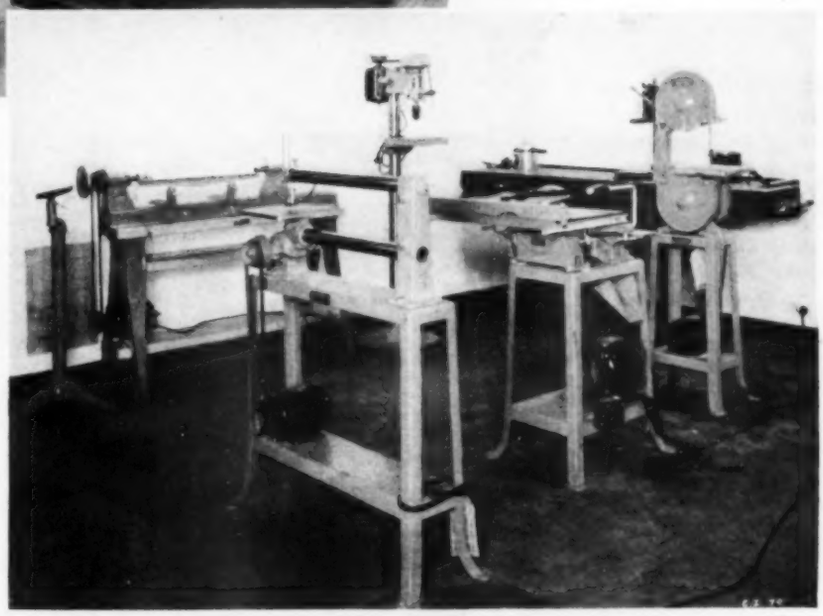
A model rolling mill with Westinghouse dual drive rolls wax ingots at the visitor's pleasure

▼



All sorts of machines and devices for applying electric heat to industry are shown in the space of the public utilities group

▼



In the model home of the electrical group there is a basement workshop for the man of the house with all the necessary tools. It will make you envious

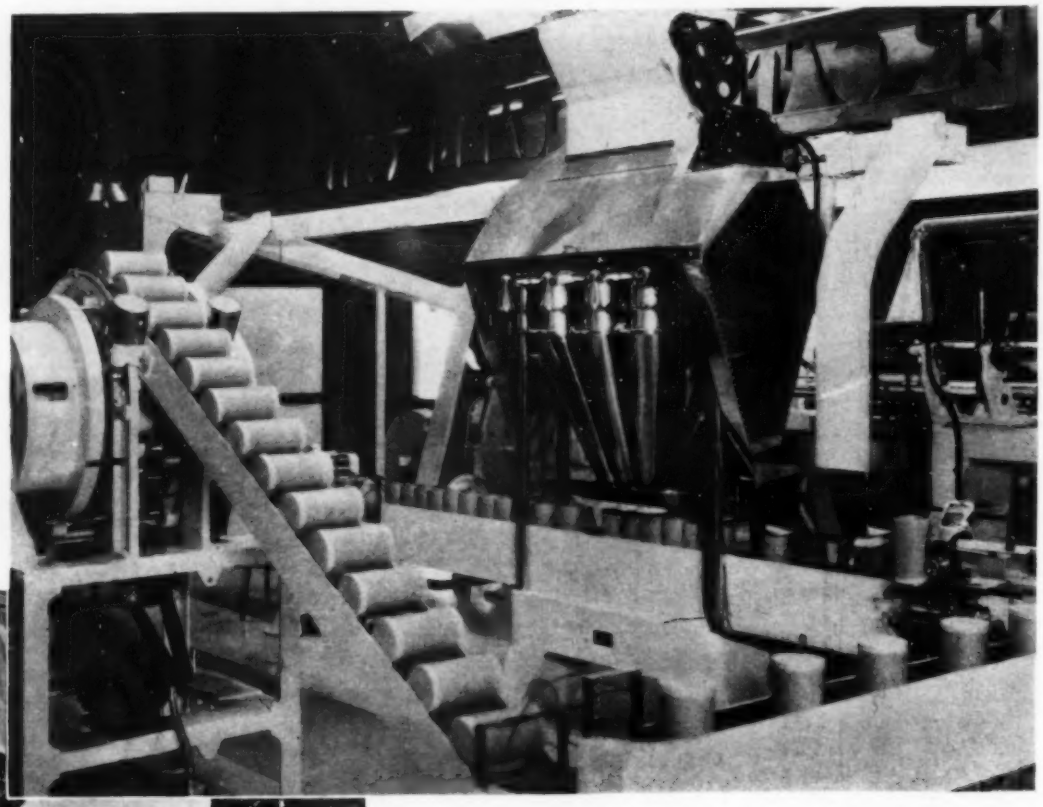
Two of the many farm implements, tractors and trucks shown by International Harvester

trucks and tractors, and sectional working models of many of the subassemblies. Coca-Cola has a complete bottling unit in operation. Kraft-Phenix Cheese Corporation makes and packages mayonnaise by machinery. Stewart & Ashby Coffee Company grinds and packages tea and coffee, which involves some of the most interesting packaging machinery. Quaker Oats Company has an equally interesting and much more extensive installation packaging and handling cereals.

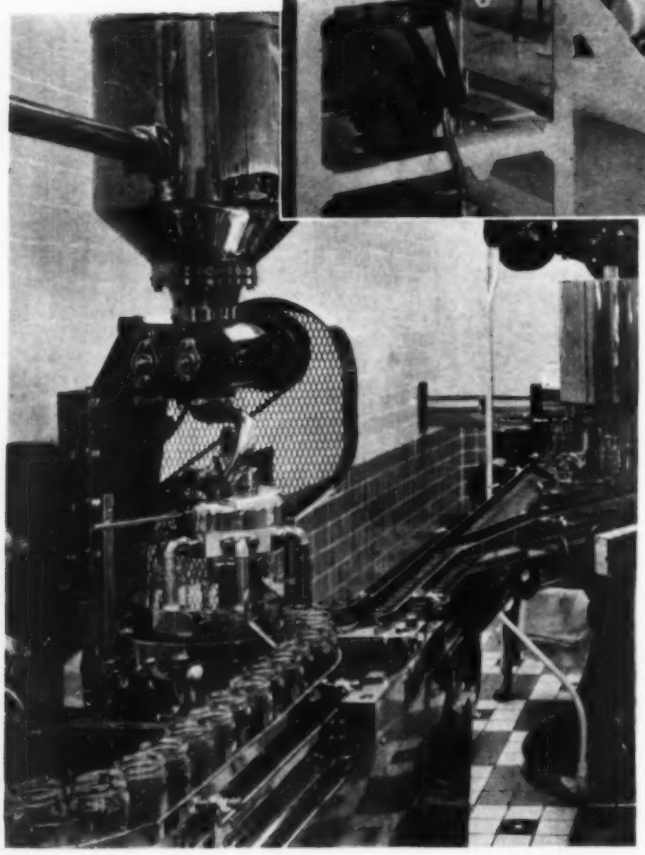
Scale models of processing plants are shown by National Biscuit, Morton Salt and National Sugar Refining of N. J. At the Heinz exhibit there are model kitchens of other times and other lands. The greatly increased use of metal and machinery in the modern kitchen shown for contrast ought to interest anyone who has anything to do with the metal-working industry.

Incidentally, and this is not an advertisement, the best place to eat that I found is the little Swedish Produce Company lunch counter in the Agricultural Building. Here they offer you a dozen kinds of Swedish and Norwegian cheese, fish and reindeer sausage sandwiches, good beer or coffee. It is a tiny place, but it will pay you to wait for a vacant stool.

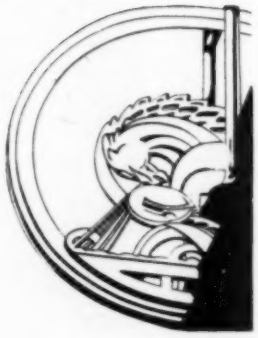
In conclusion I should like to repeat that you can only hope to hit the high spots of this amazing exposition in three days. I hope, however, that what I have set down here will serve to lead you to the high spots, and that, having seen them, you will decide to spend more time and take in more of the details. I wish I might do so myself.



Even in the Agricultural Building there is plenty of moving machinery to watch. Quaker Oats Company has an installation for packaging cereals



Another food machinery display that is worth visiting is the mayonnnaise kitchen of Kraft-Phenix. Packaging is an interesting operation



EDITORIALS

AMERICAN MACHINIST
ESTABLISHED 1877
VOLUME 77 NUMBER 13
McGRAW-HILL PUBLISHING COMPANY, INC.
K. H. CONDIT F. H. COLVIN
EDITORS

•

Industrial Control

Now that the National Industrial Recovery Act has been passed and the President has instructed General Johnson and his staff to act promptly in carrying out its provisions, industry is faced with a readjustment problem of the first magnitude. Fanatics and extremists in every camp find much to condemn in the bill. It is unquestionably a radical departure from tradition. But now that it is a law there is only one thing for the constructive element in business and industry to do, and that is to try to make it function to the best interest of all concerned.

The President and his lieutenants are making every effort to keep politics out of the situation and to make the Recovery Act justify its designation. Industry must remember, however, that the purpose of the bill is to put men back at work in shops and factories, and that any group plan or code that overlooks or slights this objective will find little favor in General Johnson's office. For this and other reasons trade groups will gain nothing by rushing to Washington with half-baked programs.

After all, the administrator of the act, no matter how able and efficient he may be, is faced with some tough questions on organization of industry groups. He and his advisers will have to decide on groupings of industries that have similar labor classifications in order to prevent injustices as between competing industries. For instance, there used to be complaint that the automobile companies were in the habit of luring skilled machinists from the machine tool builders. Competitive conditions in the latter industry made it practically impossible to pay a scale that was a matter of little concern in Detroit. And this is but one instance of the sort of difficulties that must be adjusted.

Buying and selling methods are in for a thorough overhauling. For this reason any code of practice presented must have the full cooperation of the distributors of the product if they happen to be distinct from the manufacturers. In the equipment industries this should be relatively simple to handle because of the progress already made. But retail merchandising will probably have to abandon some of its fondest traditions of loss leaders, specials and price cutting accompanied by reduction of quality and exploitation of labor through sweatshop operations by suppliers.

Underlying every effort to stabilize the practices of an industry is a uniform method of obtaining production costs. Some trade associations have gone far in this direction, others have nearly as far to go. Much of our present difficulty is caused by business men and manufacturers who do not know their costs and do not seem to care. If the Recovery Act does no more than correct this fault it will have justified itself.

In the last analysis the operation of any law depends on the good faith and ability of its administrators. General Johnson has promised fair treatment for both employer and employee. Give him the opportunity to make good on that promise.

In Stock—None

Last week an electrical contractor received a contract for the electrical work involved in putting an idle blast furnace into service. From his own stocks, which were low, he got some of the minor items needed. Most of the others he was able to get by hurried shopping around. But when it came to two vertical motors made only by three companies he was in trouble. The largest maker, which usually carried a stock of twenty of these motors in its local warehouse, had none, and there were none at the factory. The next largest, which usually stocked a dozen, had none. That reduced the possibilities to the third maker, a West Coast company. It had none in local stock but long distance telephone brought the good news that there was one new motor at the factory, and that a good used one could be obtained.

We all talk glibly about how low stocks are—and do nothing about building them up. Only when we have an experience like this one do we get serious about the situation. Let's check over our stocks to see how badly off we may be when orders begin to pile up.

No Tolerance?

Evidence of a lack of appreciation concerning tolerances crops up in unexpected places. A customer demands "accuracy within a thousandth—in fact we can allow no tolerance whatever." And this on a job where errors are sure to accumulate and affect overall dimensions.

No shop manager can conscientiously accept such an order. But the chances are that some one who knows of the inability of the customer to check errors within a thousandth or two, will take a chance that whatever slight errors exist will never be detected.

The sooner customers learn that there is no such thing as perfection, and to specify tolerances as wide as possible, the less grief will be had by all concerned. There is still much need of education as to tolerances and the sooner they are understood the better.

Baseless Worry

If all our worries were as easily to be dispelled as the worry of steel men over scarcity of scrap, how placid our life would be. Maybe there is a shortage of visible scrap in the yards, thanks partly to the quiet but continuous buying of Japanese agents of late. But what of the tracks full of junk locomotives and scrap freight cars, not to mention the decrepit passenger cars used on some roads to haul commuters? And what of the shops full of machinery of all kinds that should have been scrapped years ago? And how about the idle shipping that is rusting away? All in all, the country is full of potential scrap. A fair price per ton should bring the steel men all they need. Their worries are really baseless.

• CHIPS •

Congress passes bills providing for home mortgage relief, railroad reorganization, elimination of gold clause in all obligations public and private, coordinated employment agencies; the Glass banking reorganization bill; the industrial recovery act—and adjourns . . . Roosevelt orders recovery organization to start operations within thirty days . . . Many projects ready under public works title . . . Navy to start promptly on 32-ship program . . . General Johnson has his staff and advisers well along . . . Joint Congressional committee recommends replacement of Akron and continuation of Navy's lighter-than-air development program . . . Morgan investigation ends with public opinion decidedly against the tactics of the Senate committee's investigator . . . Kahn will be first witness on June 26 when investigation of Kuhn, Loeb & Company begins.

Mussolini's four-power pact for the preservation of peace is initiated by German, French, British and Italian representatives . . . Believed to represent a real contribution to European stability . . . Representatives of the four powers to meet early in July . . . Austrian authorities imprison Nazi leaders to stop bomb outrages . . . Hitler retaliates by expelling press attaché of the Austrian legation in Berlin . . . England avoids debt payment default by sending $10,000,000 in silver as a "token" payment . . . Italy follows suit, France defaults.

Stockholders approve Cleveland banking plan that will release $50,000,000 to depositors in Union and Guardian trust companies . . . Atchison reduces dividend . . . House passes bill authorizing R.F.C. to purchase insurance company securities up to $50,000,000 . . . Rock Island files bankruptcy petition under new law . . . Brazilian and American negotiators conclude arrangements that will release $25,000,000 of American funds frozen in Brazil . . . Many states lifting restrictions on life insurance policy loans and cash surrender payments . . . Treasury offering oversubscribed five times, banks resorting to customary padding of bids to get amounts wanted . . . French trying hard to get England and U. S. back on the gold standard . . . R.F.C. cuts loan rates and orders that cuts be passed on . . . National Steel doubles dividend rate.

Budget Director Douglas reports 1,400,000 men back at work since March 4 . . . Chevrolet output in May 35 per cent better than in May, 1932 . . . Sales of all cars likewise up . . . Pennsylvania installs air conditioning equipment in coaches, diners and chair cars . . . Packard June schedule 60 per cent above May . . . U. S. Steel takes steps to set up new code of employer-employee relations in accordance with terms of industry control legislation . . . Gulf Refining orders sixty trucks from White Motor . . . Kokomo factory of Standard Sanitary ordered to resume after fifteen months of idleness . . . Steel industry ready to raise wages ten per cent July 1 if business holds . . . U. S. Steel to lead the way . . . Leadville plant of American Smelting & Refining goes on full time . . . Soft coal industry circulates suggested industry code among coal operators . . . Atterbury advocates consolidation of railroads into two systems, privately controlled . . . Parades celebrate increased plant activity of General Motors at Tarrytown, Carnegie Steel at Duquesne . . . Michigan Central recalls engine crews . . . Borg-Warner adds 1,000 workers . . . Rail executives post wage cut notice and labor leaders threaten strike.

Automobile tire prices raised second time in five weeks . . . Macy department store customers purchased more goods in first four days of June than in any like period in the history of the store . . . Wheat reaches high for three years . . . Amtorg negotiating five million loan to buy American cotton . . . Floods threaten cities of mid-China . . . London Economic Conference opens with most observers and many of the delegates convinced that it will turn out to be just another international pow-wow . . . Kelvinator raises refrigerator prices . . . Secretary Wallace decides to set maximum processing tax on cotton and wheat . . . Secretary Roper closes 21 commercial offices abroad, reduces staffs by recalling 100 employees.

Leonard Ayres reports rate of recovery in May sharpest in history of the country . . . Backlog of U. S. Steel up 65,000 tons in May . . . Steel production continues rise as more open hearths are lighted . . . More blast furnaces blown in . . . Electric power production more than 7 per cent above 1932 . . . Car loading also ahead of corresponding figure . . . Sec. Perkins reports May payroll gain greatest in ten years . . . Business Week index rises to 62.

Industrial Bill Becomes Law

With the President's signature now affixed, the much heralded Industrial Recovery and Control Bill is now firmly entrenched on the statute books. For two years at least American industry will be the subject of an unprecedented experiment in govermental control.

Two numbers ago on these pages (*AM*—Vol. 77, page 340c.) the text of Title I of the Bill as presented to Congress was given. During the interim the Senate amended many of the sections of the Bill and the conferees of the two Houses ironed out their differences to put the measure in its final form. Because of the great importance to industry, Title I of the Bill as finally passed is given in order that the changes may be noted.

One of the principle changes in the bill since its submission to Congress is the addition of Sec. 3 (e) which authorizes the President to investigate increases in imports, to limit them, or to impose additional fees upon their entry. Another provision, which has been added, limits the licensing power to trades or industries engaged in wage or price cutting and also fixes one year as the duration of the licensing subsection.

To satisfy those opponents of the Bill, who declared suspension of the anti-trust laws would create monopolies, a clause has been included definitely outlawing monopolies and monopolistic practices. A change in the section on fines sharpens the teeth of the Bill by providing that $500 a day may be the penalty for violation of a code instead of $500 for each offense. It should also be noted that in Sec. 7 (a) and again in Sec. 7 (b), after the words "minimum rates of pay," the phrase, "maximum machine-load of employees," was inserted by Senate amendment but was stricken out in conference. While this phrase is somewhat vague, its implication was serious because of its apparent indorsement of limitation of output.

In the text of Title I of the Act as given below, two sections have been omitted. Sec. 8 deals with agriculture and specifically gives the farm bill precedence over the industry bill in borderline cases. Sec. 9, on oil regulation, provides for the control of pipe line operation. Title II, covering public works, and Title III, pertaining to emergency relief, are also omitted.

An Act

To encourage national industrial recovery, to foster fair competition, and to provide for the construction of certain useful public works, and for other purposes.

TITLE I—INDUSTRIAL RECOVERY

Declaration of Policy

Section 1. A national emergency productive of widespread unemployment and disorganization of industry, which burdens interstate and foreign commerce, affects the public welfare, and undermines the standards of living of the American people, is hereby declared to exist. It is hereby declared to be the policy of Congress to remove obstructions to the free flow of interstate and foreign commerce which tend to diminish the amount thereof; and to provide for the general welfare by promoting the organization of industry for the purpose of cooperative action among trade groups, to induce and maintain united action of labor and management under adequate governmental sanction and supervision, to eliminate unfair competitive practices, to promote the fullest possible utilization of the present productive capacity of industries, to avoid undue restriction of production (except as may be temporarily required), to increase the consumption of industrial and agricultural products by increasing purchasing power, to reduce and relieve unemployment, to improve standards of labor, and otherwise to rehabilitate industry and to conserve natural resources.

Administrative Agencies

Sec. 2 (a) To effectuate the policy of this title, the President is hereby authorized to establish such agencies, to accept and utilize such voluntary and uncompensated services, to appoint, without regard to the provisions of the civil service laws, such officers and employees, and to utilize such Federal officers and employees, and, with the consent of the State, such State and local officers and employees, as he may find necessary, to prescribe their authorities, duties, responsibilities, and tenure, and, without regard to the Classification Act of 1923, as amended, to fix the compensation of any officers and employees so appointed.

(b) The President may delegate any of his functions and powers under this title to such officers, agents, and employees as he may designate or appoint, and may establish an industrial planning and research agency to aid in carrying out his functions under this title.

(c) This title shall cease to be in effect and any agencies established hereunder shall cease to exist at the expiration of two years after the date of enactment of this Act, or sooner if the President shall by proclamation or the Congress shall by joint resolution declare that the emergency recognized by section 1 has ended.

Codes of Fair Competition

Sec. 3 (a) Upon the application to the President by one or more trade or industrial associations or groups, the President may approve a code or codes of fair competition for the trade or industry or subdivision thereof, represented by the applicant or applicants, if the President finds (1) that such associations or groups impose

• INDUSTRIAL REVIEW •

In many industrial centers the slight improvement in machinery sales has been overshadowed by concern over how the Industrial Recovery Act may affect machinery business. It is obvious that while a drive is on to get men back at work in industry efforts to sell labor saving equipment will face many obstacles. When industry hits its stride again there will be plenty of opportunity for machinery sales because reduced hours and old equipment will combine to restrict production below demand. Until then, however, equipment builders and distributors do not expect very active business. Increases of 70 per cent or more in the indexes of two machinery trade groups for May are encouraging, to say the least.

Correspondents in the Eastern territory report a distinctly better feeling, an improvement in supplies but only occasional machine orders. Pittsburgh inclines to the belief that there will be no summer slump. Here, too, supply business is growing. A few orders for machine tools have been placed. Activity of Cleveland steel plants is encouraging to equipment men in that area, who are basing their hopes on a continued improvement in commodity prices.

Business is somewhat better in Cincinnati but not enough to make anyone believe that the summer will be very good. All eyes are on signs for fall business. In Detroit the continued activity of the automobile plants has stimulated small tool and supply orders but there is little interest in machine replacements. That may come any time, however, if sales hold up. Chicago is hoping that there will be no summer slump and basing these hopes on a slight but real improvement now. People are going back to work in Milwaukee but the plants are buying little equipment. St. Louis reports that the improvement in supply business noted in May continues but that machine tool orders are scattering. Sentiment is much improved.

no inequitable restrictions on admission to membership therein and are truly representative of such trades or industries or subdivisions thereof, and (2) that such code or codes are not designed to promote monopolies or to eliminate or oppress small enterprises and will not operate to discriminate against them, and will tend to effectuate the policy of this title: Provided that such code or codes shall not permit monopolies or monopolistic practices: Provided that where such code or codes affect the services and welfare of persons engaged in other steps of the economic process, nothing in this section shall deprive such persons of the right to be heard prior to approval by the President of such code or codes. The President may, as a condition of his approval of any such code, impose such conditions (including requirements for the making of reports and the keeping of accounts) for the protection of consumers, competitors, employees, and others, and in furtherance of the public interest, and may provide such exceptions to and exemptions from the provisions of such code, as the President in his discretion deems necessary to effectuate the policy herein declared.

(b) After the President shall have approved any such code, the provisions of such code shall be the standards of fair competition for such trade or industry or subdivision thereof. Any violation of such standards in any transaction in or affecting interstate or foreign commerce shall be deemed an unfair method of competition in commerce within the meaning of the Federal Trade Commission Act, as amended but nothing in this title shall be construed to impair the powers of the Federal Trade Commission under such Act, as amended.

(c) The several district courts of the United States are hereby invested with jurisdiction to prevent and restrain violations of any code of fair competition approved under this title; and it shall be the duty of the several district attorneys of the United States, in their respective districts, under the direction of the Attorney General to institute proceedings in equity to prevent and restrain such violations.

(d) Upon his own motion, or if complaint is made to the President that abuses inimical to the public interest and contrary to the policy herein declared are prevalent in any trade or industry or subdivision thereof, and if no code of fair competition therefore has theretofore been approved by the President, the President, after such public notice and hearing as he shall specify, may prescribe and approve a code of fair competition for such trade or industry or subdivision thereof, which shall have the same effect as a code of fair competition approved by the President under subsection (a) of this section.

(e) On his own motion, or if any labor organization, or any trade or industrial organization, association, or group, which has complied with the provisions of this title, shall make complaint to the President that any article or articles are being imported into the United States in substantial quantities or increasing ratio to domestic production of any competitive article or articles and on such terms or under such conditions as to render ineffective or seriously to endanger the maintenance of any code or agreement under this title, the President may cause an immediate investigation to be made by the United States Tariff Commission, which shall give precedence to investigations under this subsection, and if, after such investigation and such public notice and hearing as he shall specify, the President shall find the existence of such facts, he shall in order to effectuate the policy of this title, direct that the article or articles concerned shall be permitted entry into the United States only upon such terms and conditions and subject to the payment of such fees and to such limitations in the total quantity which may be imported (in the course of any specified period or periods) as he shall find it necessary to prescribe in order that the entry thereof shall not render or tend to render ineffective any code or agreement made under this title. In order to enforce any limitations imposed on the total quantity of imports, in any specified period or periods, of any article or articles under this subsection, the President may forbid the importation of such articles or articles unless the importer shall have first obtained from the Secretary of the Treasury a license pursuant to such regulations as the President may prescribe. Upon information of any action by the President under this subsection the Secretary of the Treasury shall, through the proper officers, permit entry of the article or articles specified only upon such terms and conditions and subject to such fees, to such limitations in the quantity which may be imported, and to such requirements of license, as the President shall have directed. The decision of the President as to facts shall be conclusive. Any condition or limitation of entry under this subsection shall continue in effect until the President shall find and inform the Secretary of the Treasury that the conditions which led to the imposition of such condition or limitation upon entry no longer exists.

(f) When a code of fair competition has been approved or prescribed by the President under this title, any violation of any provision thereof in any transaction in or affecting interstate or foreign commerce shall be a misdemeanor and upon conviction thereof an offender shall be fined not more than $500 for each offense, and each day such violation continues shall be deemed a separate offense.

Agreements and Licenses

Sec. 4 (a) The President is authorized to enter into agreements with, and to approve voluntary agreements between and among, persons engaged in a trade or industry, labor organizations, and trade or industrial organizations, associations, or groups, relating to any trade or industry, if in his judgment such agreements will aid in effectuating the policy of this title with respect to transactions in or affecting interstate or foreign commerce, and will be consistent with the requirements of clause (2) of subsection (a) of section 3 for a code of fair competition.

(b) Whenever the President shall find that destructive wage or price cutting or other activities contrary to the policy of this title are being practiced in any trade or industry or any subdivision thereof, and, after such public notice and hearing as he shall specify, shall find it essential to license business enterprises to make effective a code of fair competition or an agreement under this title or otherwise to effectuate the policy of this title, and shall publicly so announce, no person shall, after a date fixed in such announcement, engage in or carry on any business, in or affecting interstate or foreign commerce, specified in such announcement, unless he shall have first obtained a license issued to such regulations as the President shall prescribe. The President may suspend or revoke any such license, after due notice and opportunity for hearing, for violations of the terms or conditions thereof. Any order of the President suspending or revoking any such license shall be final if in accordance with law. Any person who, without such a license or in violation of any condition thereof, carries on any such business for which a license is so required, shall, upon conviction thereof, be fined not more than $500, or imprisoned not more than six months, or both, and each day such violation continues shall be deemed a separate offense. Notwithstanding the provisions of section 2 (c), this subsection shall cease to be in effect at the expiration of one year after the date of enactment of this Act or sooner if the President shall by proclamation or the Congress shall by joint resolution declare that the emergency recognized by section 1 has ended.

Sec. 5 While this title is in effect (or in the case of a license, while section 4 (a) is in effect) and for sixty days thereafter, any code, agreement, or license approved, prescribed, or issued and in effect under this title, and any action complying with the provisions thereof taken during such period, shall be exempt from the provisions of the antitrust laws of the United States.

(a) Nothing in this Act, and no regulation thereunder, shall prevent an individual from pursuing the vocation of manual labor and selling or trading the products thereof; nor shall anything in this Act, or regulation thereunder, prevent anyone from marketing or trading the produce of his farm.

Limitations Upon Application of Title

Sec. 6 (a) No trade or industrial association or group shall be eligible to receive the benefit of the provisions of this title until it files with the President a statement containing such information relating to the activities of the association or groups as the President shall by regulation prescribe.

(b) The President is authorized to prescribe rules and regulations designed to insure that any organization availing itself of the benefits of this title shall be truly representative of the trade or industry or subdivision thereof represented by such organization. Any organization violating any such rule or regulation shall cease to be entitled to the benefits of this title.

(c) Upon the request of the President, the Federal Trade Commission shall make such investigations as may be necessary to enable the President to carry out the provisions of this title, and for such purposes the Commission shall have all the powers vested in it with respect of investigations under the Federal Trade Commission Act, as amended.

Sec. 7 (a) Every code of fair competition, agreement, and license approved, prescribed, or issued under this title shall contain the following conditions: (1) That employees shall have the right to organize and bargain collectively, through representatives of their own choosing, and shall be free from the interference, restraint, or coercion of employers of labor, or their agents, in the designation of such repre-

sentatives or in self-organization or in other concerted activities for the purpose of collective bargaining or other mutual aid or protection; (2) that no employee and no one seeking employment shall be required as a condition of employment to join any company union or to refrain from joining, organizing, or assisting a labor organization of his own choosing; and (3) that employers shall comply with the maximum hours of labor, minimum rates of pay, and other conditions of employment, approved or prescribed by the President.

(b) The President shall, so far as practicable, afford every opportunity to employers and employees in any trade or industry or subdivision thereof with respect to which the conditions referred to in clauses (1) and (2) of subsection (a) prevail, to establish by mutual agreement, the standards as to the maximum hours of labor, minimum rates of pay, and such other conditions of employment as may be necessary in such trade or industry or subdivision thereof to effectuate the policy of this title; and the standards established in such agreements, when approved by the President, shall have the same effect as a code of fair competition, approved by the President under subsection (a) of section 3.

(c) Where no such mutual agreement has been approved by the President he may investigate the labor practices, policies, wages, hours of labor, and conditions of employment in such trade or industry or subdivision thereof; and upon the basis of such investigations, and after such hearings as the President finds advisable, he is authorized to prescribe a limited code of fair competition fixing such maximum hours of labor, minimum rates of pay, and other conditions of employment in the trade or industry or subdivision thereof investigated as he finds to be necessary to effectuate the policy of this title, which shall have the same effect as a code of fair competition approved by the President under subsection (a) of section 3. The President may differentiate according to experience and skill of the employees affected and according to the locality of employment; but no attempt shall be made to introduce any classification according to the nature of the work involved which might tend to set as maximum as well as a minimum wage.

(d) As used in this title, the terms "person" includes any individual, partnership, association, trust, or corporation; and the terms "interstate and foreign commerce" and "interstate or foreign commerce" include, except where otherwise indicated, trade or commerce among the several States and with foreign nations, or between the District of Columbia or any Territory of the United States and any State, Territory, or foreign nation, or between any insular possessions or other places under the jurisdiction of the United States, or between any such possession or place and any State or Territory of the United States or the District of Columbia or any foreign nation, or within the District of Columbia or any Territory or any insular possession or other place under the jurisdiction of the United States.

Rules and Regulations

Sec. 10 (a) The President is authorized to prescribe such rules and regulations as may be necessary to carry out the purposes of this title, and fees for licenses and for filing codes of fair competition and agreements, and any violation of any such rule or regulation shall be punishable by fine of not to exceed $500, or imprisonment for not to exceed six months, or both.

(b) The President may from time to time cancel or modify any order, approval, license, rule or regulation issued under this title; and each agreement, code of fair competition, or license approved, prescribed, or issued under this title shall contain an express provision to that effect.

Meetings Feature Engineering Week at Chicago

Technical and non-technical meetings, plant visitations, presentations of honors, military demonstrations, speeches, luncheons, banquets and dances will vie with exhibits for the visitors' attention during Engineering Week at the Century of Progress, June 25-30. So full and varied is the program that those interested in the many attractions offered will have difficulty in deciding just how to apportion their time.

Among the many technical sessions offered by the American Society of Mechanical Engineers the following are of particular interest to the metal-working industry:

JUNE 26. 9:30 A.M.
MACHINE SHOP PRACTICE

Presiding officer: C. J. Oxford, Factory Superintendent and Chief Engineer, National Twist Drill & Tool Co.

Staff representative: Prof. Jos. S. Kozaka.

"Elements of Milling, Part 2," O. W. Boston and C. E. Kraus, University of Michigan.

"Cemented Carbide Cutting Tools," Malcolm F. Judkins, Engineer in Charge, Firthite Division, and William C. Uecker, Firth-Sterling Steel Co.

JUNE 26. 2:15 P.M.
MACHINE SHOP PRACTICE

Presiding officer: R. E. W. Harrison, Consulting Engineer.

"Recent Progress of X-ray Inspection of Welds," Herbert R. Isenberger, St. John X-ray Service Corporation.

"Results of Research Relating to the Theory of Metal Cutting," Friedrich Schwerd, Hanover, Germany.

JUNE 27. 9:30 A.M.
MACHINE SHOP—FOUNDRY

Presiding officer: W. F. Coleman, vice-president, W. A. Jones Foundry & Machine Co.

"Development of Cast Iron for Machine Construction," Oliver Smalley, Technical Director, and W. Worley Kerlin, Metallurgist, Gray Iron Institute.

"Notes on Electric Cast Iron Practice," H. H. Walther, Metallurgist, Dayton Steel Foundry Co.

JUNE 27. 2:30 P.M.
AERONAUTIC CONSTRUCTION DIVISION

Presiding officer: William B. Mayo

"The Resistance Welding of Aluminum and Its Alloys," D. I. Bohn, and G. O. Hogland, Aluminum Co. of America.

"Stainless Steel in Aircraft Construction," Frederick Flander Aeronautical Engineer, Curtiss Aeroplane and Motor Co.

JUNE 27. 8 P.M.
SCIENCE AND ENGINEERING

"Industrial Development of the Century," A. P. M. Fleming, Manager of Research and Education Department, Metropolitan-Vickers Electrical Co., Manchester, England.

JUNE 29. 9:30 A.M. MANAGEMENT

Presiding officer: C. B. Auel, Manager, Employment Service Department, Westinghouse Electric & Mfg. Co.

"Factors to be Considered in the Substitution of a Different Material in a Product," J. L. Alden, Assistant Superintendent, Manufacturing Development, Weston Electric Co.

"Principles of Coordinated Visual Control," Eugene Szepesi, Consulting Management Engineer.

JUNE 29. 2:15 P.M. MANAGEMENT

Presiding officer: L. P. Alford, Vice-President, Ronald Press Co.

"Present Tendencies in Organizing for Manufacture of Diversified Product," A. F. Murray, Director of Manufacturing Operations, Westinghouse Electric & Mfg. Co.

"The Economic Significance of Replacement Cycle in Demand," T. M. McNiece, Industrial and Marketing Analyst.

The program of the American Society of Industrial Engineers was given previously (*AM*—Vol. 77, page 244c).

The American Society for Testing Materials in addition to an elaborate program of technical papers and committee reports will sponsor an exhibit of testing apparatus at the Stevens Hotel.

May Machine Tool Orders 70 Per Cent Higher

From a level of 16.2 in April, as compiled by the National Machine Tool Builders' Association, the gross order index rose to 27.6 in May. This is the highest figure since January, although still considerably below the 1932 average of 35.4. The rise represents a recovery from the three months' period of stagnation in the industry incident to the banking holiday and other disturbing factors.

Individual reports show that at least two-thirds of the reporting companies enjoyed the improvement, but the large shops, represented by Index A, gained most with an increase of 78 per cent. Twenty-seven companies did better than

May Orders for Machine Tools

	Index A	Index B	Index C	Total
Number of reports	25	26	21	72
Class bases	$2,541,974	$639,239	$122,712	$3,303,925
Gross orders for the month	29.0	20.8	33.2	27.6
Cancellations	0.6	0	0.1	0.5
Net orders	28.4	20.8	33.1	27.1
Shipments	22.0	19.6	57.9	22.9
Unfilled orders	30.8	38.3	38.2	32.5
Three months' average of gross orders	19.4	15.6	28.0	19.1

Base — Average shipments for years 1922-24.
Index A — Base more than $50,000.
Index B — Base $10,000 to $50,000.
Index C — Base less than $10,000.

30 per cent of their bases during May as against only 13 during April. This reflects a good distribution of orders which always indicates a better foundation for optimism than a spotty improvement.

• BUSINESS ITEMS •

The Taft-Peirce Mfg. Co., Woonsocket, R. I., has opened a new office and warehouse at 2921 East Grand Boulevard, near Beaubien, Detroit, Mich., where a complete stock of tools, gages, and magnetic chucks and other products of the Small Tool Division will be carried on hand. Activities will be under the direction of M. L. Higgins, formerly Chicago branch sales manager.

The Ex-Cell-O Aircraft & Tool Corp., 1200 Oakman Blvd., Detroit, Mich., has appointed M. J. Schmitt, 1501 S. 83d St., West Allis, Wis., as representative in the Milwaukee territory. He will handle products of the Continental Tool Division and the Ex-Cell-O Division.

• PERSONALS •

E. J. Smith has been appointed manager of the Painted Post, N. Y., plant of the Ingersoll-Rand Co. He succeeds Frederick Parsons, who died recently.

A. J. Weigand, production manager of the Wilkening Mfg. Co., producers of "Pedrick" piston rings, has left for Europe on a three months vacation. Mr. Weigand is still suffering from an automobile accident which occurred on a business trip in Canada.

R. J. Whelan, president of the Ohio Nut & Bolt Co., has been elected president of the American Institute of Bolt, Nut and Rivet Manufacturers. He succeeds George S. Case, president of the Lamson & Sessions Co.

Navy Building Program Announced

Navy yards will operate at full capacity for three years and jobs for 50,000 men will be provided by a program of naval construction announced by Claude A. Swanson, Secretary of the Navy. The cost of the new vessels will be covered by $238,000,000 allocated under the public works section of the industrial recovery legislation.

Vessels to be built are in the following categories:

Two aircraft carriers of 15,000 tons each,

Four light cruisers of 10,000 tons each,

Four destroyers of 1,850 tons and sixteen of 1,500 tons,

Four submarines of 1,400 tons each,

Two gunboats of 2,000 tons each.

• OBITUARIES •

James A. Shepard Dies

On June 12, James A. Shepard, vice-president of the Shepard Niles Crane & Hoist Corporation, died at his summer home at Kayutah Lake, N. Y., at the age of 69. In 1880 Mr. Shepard with his father and brother established a foundry and machine shop at Montour Falls, N. Y., under the name of W. H. Shepard & Co. This company was sold in 1903, when Mr. Shepard founded the General Pneumatic Tool Co. which later became the Shepard Electric Crane & Hoist Co. Several years later this concern purchased the Sprague Electric Hoist Co. and the Niles Crane Co. to reorganize under the title Shepard Niles Crane & Hoist Corporation.

Herman Koestlin, founder of the Koestlin Tool & Die Corp., Detroit, died recently in Alaska. Mr. Koestlin learned the pattern and die making trades in Rochester and was at one time department superintendent for the Eastman Kodak Co. He then went to Detroit and established his own shop.

Arthur E. Baker, 76, president of Baker Bros., Inc., Toledo, manufacturer of drilling machinery, died June 2. Mr. Baker had been president of the company for many years. The business was established by Herbert Baker, a brother.

Allen M. Foster, founder of the Foster Bolt & Nut Mfg. Co., in 1909, and a director of the Lamson & Sessions Co. since the purchase of his firm in 1930, died at Cleveland, May 31.

George M. North, treasurer and director of the Ferry Cap & Set Screw Co., Cleveland, died June 9 at the age of 78.

Francis B. Quackenboss, purchasing agent of the Graton & Knight Mfg. Co., Worcester, Mass., died June 5 at the age of 42. Mr. Quackenboss had been with the company since 1912 when he entered its service as assistant to the president.

• MEETINGS •

American Foundrymen's Association. Annual convention and foundry and industrial exposition. June 20-23. Stevens Hotel, Chicago. C. E. Hoyt, executive secretary, 222 West Adams St., Chicago, Ill.

Silver Bay Industrial Conference. Sixteenth annual conference on industrial relations. August 23-26. Silver Bay on Lake George, N. Y. E. C. Worman, secretary, 347 Madison Ave., New York, N. Y.

Society of Automotive Engineers. International automotive engineering congress. August 28-September 4. Palmer House, Chicago. John A. C. Warner, general manager and secretary, 29 West 39th St., New York, N. Y.

Meeting During Engineering Week Chicago World's Fair

American Society of Mechanical Engineers. Semi-annual meeting. June 25-30. Palmer House, Chicago. Calvin W. Rice, secretary, 29 West 39th St., New York, N. Y.

American Society for Testing Materials. Annual meeting. June 26-30. Stevens Hotel, Chicago. C. L. Warwick, secretary, 1315 Spruce St., Philadelphia, Pa.

Midwest Engineering & Power Exposition. June 25-30. Coliseum, Chicago. Headquarters, 308 West Washington St., Chicago, Ill.

Society of Industrial Engineers. Annual meeting. June 27-30. Stevens Hotel, Chicago. George C. Dent, secretary, 205 West Wacker Drive, Chicago.

One Channel?

"Say, Al, I want to apologize for leaving your factory so abruptly the other day, but you got talking with that salesman and I didn't know when you would get through. I had several things I wanted to do before quitting time so I had to get back to the factory. I was interested in some of the tricks you have down there, and I'm coming down again to get a closer view of them."

"Fine, Ed. Come down whenever you can."

"By the way; I was amused at the way you handled that salesman. The way you were kicking about them a couple of weeks ago, I thought you would go up in the air, but you didn't. The salesman didn't seem happy."

"He wasn't. I was telling him about a new scheme I am hoping to put over, and he didn't seem to agree with me."

"What new scheme have you in mind now?"

"Oh, one that will save me a lot of bother and will keep the salesmen out of my office."

"But you don't want to keep them out. How are you going to find out what is new in the machine line unless you listen to the salesmen? Don't be so grouchy."

"I'm not being grouchy, Ed. I don't mean all I say about not wanting to meet salesmen. Some of them are nice fellows, others are broad-minded men from whom I always learn something new and interesting. It is only a few of them that are so persistent and aggressive as to be irritating."

"Sure, they're nearly all good scouts, and they have to make a living."

"Sure, and so've I. I'm not doing it because I dislike salesmen; I'm doing it to simplify buying."

"Doing what?"

"Why, I'm trying to make arrangements so that one man will supply all our machinery and supplies."

"I don't quite get you."

"I mean that instead of placing an order for a milling machine with one man, for a grinder with another, and for twist drills with another, I'll just order them all from one man or concern."

"You mean you're going to let an outsider pick out the make of machinery you will use and the kind of drills?"

"Not at all. If I want a certain kind of machine I'll tell this man what to get, if I don't care what kind it is or don't know anything about it, I'll tell him what I want it for and rely on his judgment."

"My gosh, Al, you do the most childish things sometimes. If you do that, do you know what make of tools and drills you are going to get?"

"Sure I know. I'm going to get what I order, or what he thinks is best."

"You are, like fun. You'll get the makes that he is agent for. That's what you'll get."

"You're off on your psychology, Ed. An honest man will be so fearful of being suspected of what you say, that he'll lean over backward."

"Yes, a man may be honest but be human at the same time. Manufacturers that have salesmen in this territory will not allow him a commission and he's not going to do it for love."

"Sure he's got to live, but I figure that if we give him all our business he can afford to lose his commission on some of it. It won't cost him anything except time."

"What are you going to save out of it?"

"We will save time, trouble and bookkeeping and will simplify our methods of doing business."

"But how about the other poor salesmen?"

"If they call and I want something I will send them to my dealer."

"Oh, you're going to build up his business and get him a little rake-off from the other salesmen, too. Are you a silent partner, or what?"

Is Al's scheme of buying everything through one dealer feasible? Will it save him anything in the long run?

Discussion

Keeping Time

When Al says, "We don't put all our delays and errors into our costs," the question arises—where does he put them? It seems that because Al has "stolen a march" on his competitors, by having devised a superior type of compressor, he can afford to take chances on his costs by charging much more for the products than they actually cost. So long as there is a demand for the articles he produces, and his competitors lag behind, he will get away with his rough-and-ready methods of keeping his business accounts. But because he is successful, it does not prove that he is following a safe and sure way.

In effect, he says, "Let other people pay." Such, too frequently, passes for business morality. A higher type of business man would recognize that the discovery of a better type of compressor is a discovery of how to adapt natural resources, and that it would be more honorable for him to limit his charges to the cost of the effort he put into the discovery and not use it as a means to exploit the public. That cost and all other human efforts that enter into production can only be measured by time, and until that is seen by business men, accurate costs cannot be obtained.

—L. Brown.

A Better Shop

Assuming Al's new shop to be modern in lighting, heating, ventilating, and equipment, to improve working conditions he must schedule a constant flow of work to comply with his promised shipments, without breaking up jobs on machines or the assembly floor.

In a small shop, it is necessary to pay a small margin higher than the standard wage rate, to secure the best caliber of men and to reduce labor turnover, as this is costly in a small shop.

Al must build up a standard of shop rules, and live up to them himself. By so doing he will have no trouble keeping the men under discipline.

A reasonable incentive on the output, such as a group bonus on assembly, a premium on machine operations or a weekly bonus is helpful. There is nothing that improves conditions for a man like making him feel his extra efforts are appreciated. If he makes a suggestion worth while, tell him so, and if it is good enough, pay him for it. If his suggestion does not prove practical, show him why you do not adopt it. Nothing is more discouraging than to make a suggestion and never to hear anything further about it.

Keep the shop and tools in order.

—H. A. Gilliland.
Mechanical Engineer,
Hamilton, Canada.

Many an employer has made the mistake of promising a reward to employees and has found out later that he was unable, disinclined, or just forgot to make good his obligation.

Promises are not the best way to hold the employee's interest, as they are likely to be made to a man who does not prove entirely satisfactory in the boss's view, but is 100 per cent in his own view.

A much better method, and one that has been worked to good advantage, is to consider each man separately and give each one a check at Christmas time according to his loyalty, ability and efficiency. —C. F. Staples.

High Finance

If I were Al, I would not suggest that Ed become a stockholder in Al's company. The money Ed would invest with Al he might need someday, and it is seldom that stock in a small concern can be sold at par as purchasers are hard to locate.

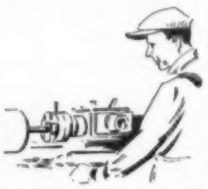
From Al's point of view, I would rather not have any stockholders other than myself and Mason. A small corporation should have all its stockholders entirely dependent upon it for their living. Outsiders' investment in their corporation might deter the partners from making some venture which looked good but risky.

If Ed does invest, I would suggest that he visit the shop as often as possible, at least not less than once every two weeks and better every day after work. Should Ed invest he would, as Al says, be a large stockholder so he should feel a personal interest in how his money is being spent.

—Herbert P. Hinckley.

Is Talk Cheap?

A friend of mine went into the manufacturing business early in 1932, perhaps trying to emulate Al and Mason. He was hardly settled before he was besieged with salesmen. He finally evolved



a simple and effective plan which he has used with much success up to the present. When a salesman enters his office, he greets him saying:

"I'm supplied with everything that I think I need now. My equipment is in as near perfect condition as my limited funds will permit. Every move I make I must take into consideration the bankers as holders of my note. If you feel that it is worth your while to speak to me, in spite of the things I've told you, I am willing to listen to you for exactly five minutes. If you have new ideas or suggestions, your remaining will be justified; otherwise, you will be saving time for both of us, by cutting your stay short."

I've no doubt that he felt silly advancing such a spiel, but it's worked wonders. The only salesmen who still have the perseverance to come to his office are those who have some product which is really worthwhile and which he is in a position to purchase.

—Fred Bennett,
Standard Products Company.

Renovizing

Al has leased a new shop to increase business. This gives proof that the old shop was not adequate, either on account of its size or because the owners did not foresee future enlargement. They must not again fall into the same error of lack of foresight.

Transferring only the men and machinery to a larger shop certainly would increase working capacity but surely not efficiency. Al then must plan not only to spend $500 in better lights and floors but also to study the new installation with a view to the future; to provide place and location for possible new equipment, and wiring capacity for a future increase in power requirements.

—Fausto Becerril.

It is easy to spend too much money when moving a shop into larger quarters. Extremely good judgment, backed by experience, is required to determine the stopping point.

Al seems to be headed in the right direction. Time and money invested in planning saves money over and over again. Every shop should be laid out to scale on a convenient size sheet before anything else is done. It is much easier to change a drawing than to shift machinery when the starting layout is found to be wrong.

The new plant should be thoroughly cleaned, the right kind of floors placed and put into first class condition, the walls and ceiling painted to reflect the light. These matters should all be attended to before a single machine is moved. —L. O. Brown.

Production Control

Scientific production control is essential to the success of both the small and large concern. The savings secured through such a system must, of course, justify its installation and operation.

In a large company, capable specialists are delegated the responsibilities of scheduling, routing, best operation sequence determination, tooling and costing, and lines of authority established. In the small company, several of these functions must necessarily become the duty of one man.

Al and Mason must analyze their requirements and scientifically direct and organize their own activities, keeping in mind always the fact that they are the head of several departments and responsible for certain distinct and separate functions. Their business must at all times be in such an operating condition that either may be absent for a protracted period of time without ill effects.

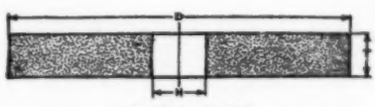
The day of the "indispensable boss" is gone. —Ira S. Williams.

American Machinist
REFERENCE BOOK SHEET

Standard Types of Grinding Wheels—I

TABLE 1.—*Minimum sizes of arbor holes given in inches for various diameters and thicknesses of grinding wheels*

Diameter, in inches	Thickness of wheel, in inches																	
	¼	5/16	⅜	7/16	½	1	1¼	1⅜	1½	2	2¼	2⅜	2½	3	3¼	3⅜	4	4½	5
6	½	½	½	½	½	½	½	½	½	½	½	½	½	½	½	½	1	1	1
7	½	½	½	½	½	½	½	½	½	½	½	½	½	1	1	1	1	1	1
8	½	½	½	½	½	½	½	½	½	½	½	1	1	1	1	1	1¼	1¼	1¼
9	½	½	½	½	½	½	½	½	½	1	1	1	1	1	1¼	1¼	1¼	1¼	1¼
10	½	½	½	½	½	½	½	½	½	1	1	1	1¼	1¼	1¼	1¼	1¼	1¼	1¼
12	½	½	½	½	½	1	1	1	1	1	1	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼
14	½	½	½	½	1	1	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼
16					1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼
18					1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼
20						1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼
24						1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	2	2	2	2	2
28						1¼	1¼	1¼	1¼	1¼	1¼	1¼	2	2	2	2	2½	2½	2½
30							1¼	1¼	1¼	2	2	2	2	2	2½	2½	2½	2½	2½
36									2	2½	2½	2½	2½	2½	2½	2½	3	3	3



Type No. 1.—Straight

TABLE 2.—*Type No. 1 straight wheels—vitrified and silicate*

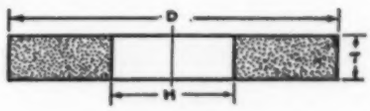
D Diameter, in inches	T Thickness of wheels, in inches	H Arbor hole, in inches
¼	⅛	As ordered.
5/16	⅛ ⅜	Do.
⅜	⅛ ⅜	Do.
7/16	⅛ ⅜	Do.
½	⅛ ⅜ ½	Do
⅝	⅛ ⅜ ½ ⅝ 1	
¾	⅛ ⅜ ½ ⅝ 1	Do.
1	⅛ ⅜ ½ ⅝ 1	Do.
1¼	⅛ ⅜ ½ ⅝ 1 1¼	Do.
1½	⅛ ⅜ ½ ⅝ 1 1¼ 1½	Do.
1¾	⅛ ⅜ ½ ⅝ 1 1¼ 1½	Do.
2	⅛ ⅜ ½ ⅝ 1 1¼ 1½ 2	Do.
2½	⅛ ⅜ ½ ⅝ 1 1¼ 1½ 2	Do.
3	⅛ ⅜ ½ ⅝ 1 1¼ 1½ 2	Do.
3½	⅛ ⅜ ½ ⅝ 1 1¼ 1½ 2	Do.
4	⅛ ⅜ ½ ⅝ 1 1¼ 1½ 2	Do.
4½	⅛ ⅜ ½ ⅝ 1 1¼ 1½ 2	Do.
5	⅛ ⅜ ½ ⅝ 1 1¼ 1½ 2	Do.
6	⅛ ⅜ ½ ⅝ 1 1¼ 1½ 2	Do.
7	⅛ ⅜ ½ ⅝ 1 1¼ 1½ 2	Do.
8	⅛ ⅜ ½ ⅝ 1 1¼ 1½ 2	Do.
		Note 2 applies to the following diameters:
10	⅛ ⅜ ½ ⅝ 1 1¼ 1½ 2 2½ 3 3½ 4 5 6 7 8	5.
12	⅛ ⅜ ½ ⅝ 1 1¼ 1½ 2 2½ 3 3½ 4 5 6 7 8	5.
14	½ ⅝ 1 1¼ 1½ 2 2½ 3 3½ 4 5 6 7 8	5.
16	1 1¼ 1½ 2 2½ 3 3½ 4 5 6 7 8	5, 6,
18	1 1¼ 1½ 2 2½ 3 3½ 4 5 6 7 8	5, 6, 8, 10.
20	1¼ 1½ 2 2½ 3 3½ 4 5 6 7 8	5, 6, 8, 10, 12.
24	1½ 1¾ 2 2½ 3 3½ 4 5 6 7 8	5, 6, 8, 10, 12.
28	1¾ 2 2½ 3 3½ 4	12.
30	1¾ 2 2½ 3 3½ 4	12.
36	1¾ 2 2½ 3½ 4	12, 24.

Note 1—Refer to Table 1 for minimum arbor holes. Also see Tables 3, 4 and 5
Note 2—Arbor holes less than 5 inches in diameter as ordered

TABLE 3.—*Type No. 1, internal grinding wheels recommended for new machine design*

Diameter, in inches	Arbor hole	Diameter, in inches	Arbor hole	Diameter, in inches	Arbor hole
	Inch		Inch		Inches
¼	1/16	1¼	⅜	3	¼
5/16	1/16	1⅜	⅜	3	⅜
⅜	1/16	1½	⅜	3½	¼
7/16	1/16	2	⅜	3½	⅜
½	1/16	2	½	4	¼
⅝	⅛	2	⅝	4	⅜
¾	⅛	2	¾	4	½
⅞	⅛	2½	⅜	4	⅝
1	⅛	2½	½	4	¾
1	¼	2½	⅝		

NOTE.—Thickness (in inches), ¼, 5/16, ⅜, 7/16, ½, ⅝, ¾, 1, 1¼, 1½, 1¾, 2, and 2½.



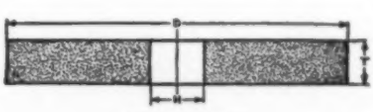
Type No. 1.—Straight

TABLE 4.—*Type No. 1, straight cylindrical grinding wheels recommended for new machine design*

D Diameter, in inches	T Thickness, in inches	H Arbor hole	D Diameter, in inches	T Thickness, in inches	H Arbor hole
		Inches			Inches
10	As ordered	5	20	As ordered	12
12	do	5	24	do	8
14	do	5	24	do	8
16	do	5	24	do	12
18	do	5	26	do	12
18	do	8	30	do	12
20	do	5	30	do	20
20	do	8	36	do	12

TABLE 5.—*Type No. 1, straight wheels with large holes for tool grinding recommended for new machine design*

D Diameter, in inches	T Thickness, in inches	H Arbor hole
		Inches
14	As ordered	5
20	do	8
24	do	10
28	do	12
36	do	24



Type No. 1.—Straight

TABLE 6.—*Type No. 1, wheels (organic bonds)*

D Diameter, in inches	T Thickness of wheels, in inches	H Arbor hole, in inches
1	1/16 1/8 3/16 ¼ 5/16 ⅜ 7/16 ½	As ordered.
1½	1/16 1/8 3/16 ¼ 5/16 ⅜ 7/16 ½	Do.
2	1/16 1/8 3/16 ¼ 5/16 ⅜ 7/16 ½	Do.
2½	1/16 1/8 3/16 ¼ 5/16 ⅜ 7/16 ½	Do.
3	1/16 1/8 3/16 ¼ 5/16 ⅜ 7/16 ½	Do.
4	3/32 1/16 1/8 3/16 ¼ 5/16 ⅜ 7/16 ½	Do.
5	3/32 1/16 1/8 3/16 ¼ 5/16 ⅜ 7/16 ½	Do.
6	3/32 1/16 1/8 3/16 ¼ 5/16 ⅜ 7/16 ½	Do.
7	1/16 1/8 3/16 ¼ 5/16 ⅜ 7/16 ½	Do.
8	1/16 1/8 3/16 ¼ 5/16 ⅜ ½ ⅝ 1	Do.
		Note 2 applies to the following diameters:
10	1/8 3/16 ¼ 5/16 ⅜ ½ ⅝ 1 1¼ 1½ 2	5.
12	1/8 3/16 ¼ 5/16 ⅜ ½ ⅝ 1 1¼ 1½ 2	5.
14	1/8 3/16 ¼ 5/16 ⅜ ½ ⅝ 1 1¼ 1½ 2	5.
16	¼ 5/16 ⅜ ½ ⅝ 1 1¼ 2 2½ 3 4	5, 6.
18	⅝ 1 1¼ 1½ 2 2½ 3 4	5, 6, 8, 10.
20	1 1¼ 1½ 2 2½ 3 4	5, 6, 8, 10, 12.
24	1½ 2 2½ 3 4	5, 6, 8, 10, 12.
30	2½ 3 4	12.

Note 1—Refer to Table 1 for minimum arbor holes. Also see Tables 2, 4, 5 and 8
Note 2—Arbor holes less than 5 inches in diameter as ordered

Reprinted from Simplified Practice Recommendation R45-32, "Grinding Wheels" (Fourth Edition) issued April 13, 1933 by the Bureau of Standards, U. S. Department of Commerce. Types of grinding wheels formerly recommended but eliminated from this edition are: Type 3—tapered one side; Type 5—continuous dovetail; Type 9—double cup; Type 10—raised dovetail, and Type 14—offset. A standard (*AM*-Vol. 65, page 465) is superseded.

© AMERICAN MACHINIST

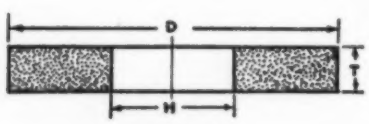
American Machinist
REFERENCE BOOK SHEET

Standard Types of Grinding Wheels—I

Type No. 1.—Straight

TABLE 7.—*Type No. 1, straight cutting-off and slotting wheels (organic bonds)*

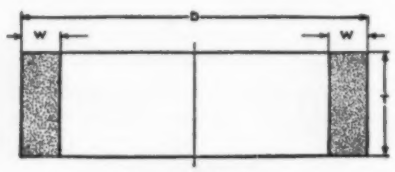
D Diameter, in inches	T Thickness	H Arbor hole, in inches	D Diameter, in inches	T Thickness	H Arbor hole, in inches
	Inch			Inch	
4	1/32	As ordered.	7	1/4	As ordered.
4	1/16	Do.	8	1/16	Do.
4	3/32	Do.	8	1/32	Do.
4	1/8	Do.	9	1/8	Do.
5	1/16	Do.	10	3/32	Do
5	1/8	Do.	10	1/8	Do.
6	1/32	Do.	12	3/32	Do.
6	1/16	Do.	12	1/8	Do
6	1/8	Do.	14	1/32	Do.
6	1/8	Do.	14	1/8	Do
7	1/16	Do.	16	1/8	Do



Type No. 1.—Straight

TABLE 8.—*Type No. 1, straight wheel sizes recommended for new design high-speed, swing-frame, and floor-stand grinding machines. Organic bonded wheels only*

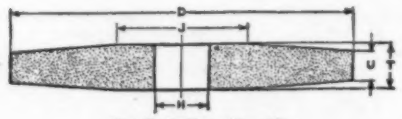
D Diameter, in inches	T Thickness	H Arbor hole	D Diameter, in inches	T Thickness	H Arbor hole
	Inches	Inches		Inches	Inches
16	2, 2½, 3	6	24	2, 2½, 3, 4	10, 12
18	2, 2½, 3	6, 8, 10	30	3, 3½, 4	12
20	2, 2½, 3	6, 8, 10	36	3, 3½, 4	12



Type No. 2.—Cylinder

TABLE 9.—*Type No. 2, cylinder wheels*

D Diameter, in inches	T Thickness	W Thickness of wall	D Diameter, in inches	T Thickness	W Thickness of wall
	Inches	Inches		Inches	Inches
8	4	1	18	3	2
10	4	1	18	4	2
10	4	1¼	18	4	4
10	4	1½	18	5	1¼
12	4	1¼	18	5	1½
12	4	1½	18	5	4
14	4	1¼	18	6	2
14	4	1½	18	6	4
14	5	3/16	20	4	4
16	4	3/32	20	6	2
16	4	2	20	6	2¼
16	4	3	20	6	4
16	5	1¼	24	6	2¼
16	5	1½	30	6	2
16	6	2	30	6	3
16	6	3			



Type No. 4.—Tapered two sides

TABLE 10.—*Type No. 4, wheels (tapered two sides)*

D Diameter, in inches	Taper ¾ inch per foot: U Width of face	Taper ½ inch per foot: U Width of face	H Arbor hole, in inches	D Diameter, in inches	Taper ¾ inch per foot: U Width of face	Taper ½ inch per foot: U Width of face	H Arbor hole, in inches
	Inches	Inches			Inches	Inches	
10	1		As ordered.	18	2½	2½	As ordered.
10	1½		Do.	18	3	3	Do.
12	1¼		Do.	20	2	2	Do.
12	2	2	Do.	20	2½	2½	Do.
12	2½		Do.	20	3	3	Do.
14	1	1	Do.	20		3½	Do.
14	1½		Do.	22		2	Do.
14	1¾	1¾	Do.	22	2½	2½	Do.
14	2	2	Do.	24		1½	Do.
16	1		Do.	24	2	2	Do.
16	1½		Do.	24	2½	2½	Do.
16	2	2	Do.	24	3	3	Do.
16	2½		Do.	24		3½	Do.
16	3		Do.	24	4		Do.
18		1	Do.	26		4	Do.
18	1½	1½	Do.	30	2½	2½	Do.
18	1¾		Do.	30	3	3	Do.
18	2	2	Do.	30	4	4	Do.

Note—Refer to Table 1 for minimum arbor holes

Type No. 6.—Straight cup

(Wheels of this type can be furnished with beveled face)

TABLE 11.—*Type No. 6, straight-cup wheels*

	Straight face					Bevel face	
D Diameter, in inches	T Thickness	H Arbor hole, in inches	W Thickness of wall	E Center or back thickness	R Radius	A Flat spot of beveled wall	V Angle of bevel
	Inches		Inches	Inches	Inch	Inch	°
2½	1½	As ordered	¾	¾	1/16	1/16	30
3	1½	do	¾	¾	1/16	1/16	30
3½	1¾	do	¾	¾	1/16	1/16	30
4	1½	do	¾	¾	1/16	1/16	30
5	1½	do	¾	¾	1/16	1/16	30
8	4	do	1	1			
8	5	do	1	1			
8	6	do	1	1			
10	4	do	1	1			
10	4	do	1¼	1¼			
10	4	do	1½	1½			
12	4	do	1¼	1¼			
12	4	do	1½	1½			
12	5	do	1½	1½			
12	6	do	1¾	1¾			
14	4	do	1¼	1¼			
14	4	do	1½	1½			
14	5	do	1¼	1¼			
14	6	do	1½	1½			
16	5	do	2	2			
20	6	do	2	2			
20	4	do	1¾	1¾			
24	6	do	2½	2½			
30	8	do	2½	2½			

Note: Type 5 will be found on the Reference Book Sheet "Standard Types of Grinding Wheels—II".

© AMERICAN MACHINIST

Gear Tooth Finishing—II

FRED H. COLVIN
Editor, American Machinist

Conclusion of a staff survey of present practice covers spiral bevel and hypoid gear lapping and the general methods of the gear departments of several important automobile plants

THE LAPPING of spiral bevel and hypoid gears is quite naturally done on Gleason machines. In the later models of these machines the meshing positions vary during the lapping operation. The pinion drives the gear and the position of the gear changes automatically and continuously, effecting a combined horizontal and vertical movement of the gear with relation to the pinion. Both sides of the teeth can be lapped to secure a good bearing for both the drive and coast sides of the teeth. The lapping compound is circulated by a pump unit as in other machines. A powdered India oilstone, known as Velvite and carried in a light oil, gives good results. Sometimes a little F F F carborundum, or its equivalent, is used to speed the cutting. While nearly all machines circulate the abrasive, one user prefers to use a paste and apply it with a brush. The abrasives used varied but little in the different plants visited.

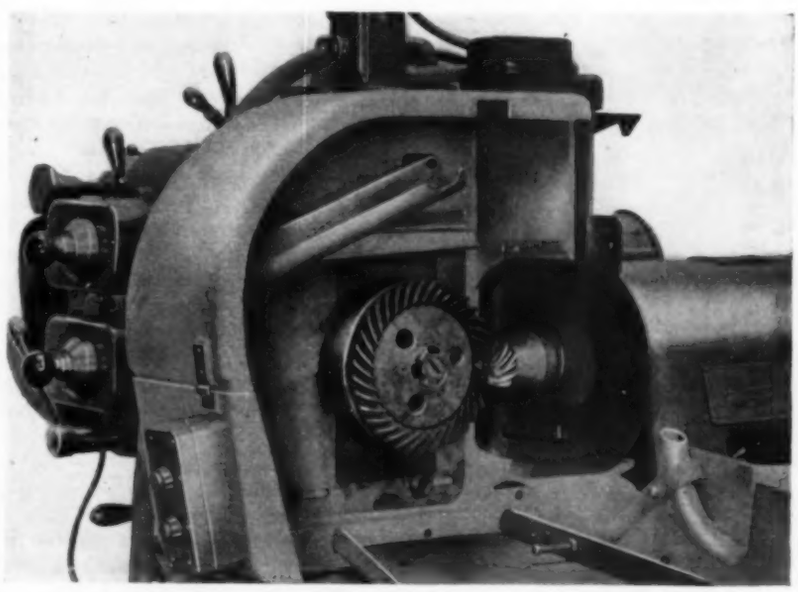
Sight and Sound Methods

The quest of one large company, whose transmissions must carry up to 150 hp. or more, and whose engineers demand extreme quietness, has led through devious and expensive paths, and not always with satisfactory results. No expense has been spared for special equipment for grinding, lapping and measuring the teeth as to form and helix angle. Teeth are ground by both methods. They are lapped in various ways in special machines using special laps and by running mating gears together, with great care as to center distance. This company has almost abandoned its delicate measuring instruments, that show "tenth" variations in tooth contour and angles, for what may be called the "sight and sound" method. "Sight" to note the bearing of the teeth, and "sound" to check the correctness of the sight. The practice refers particularly to gears that are ground after hardening.

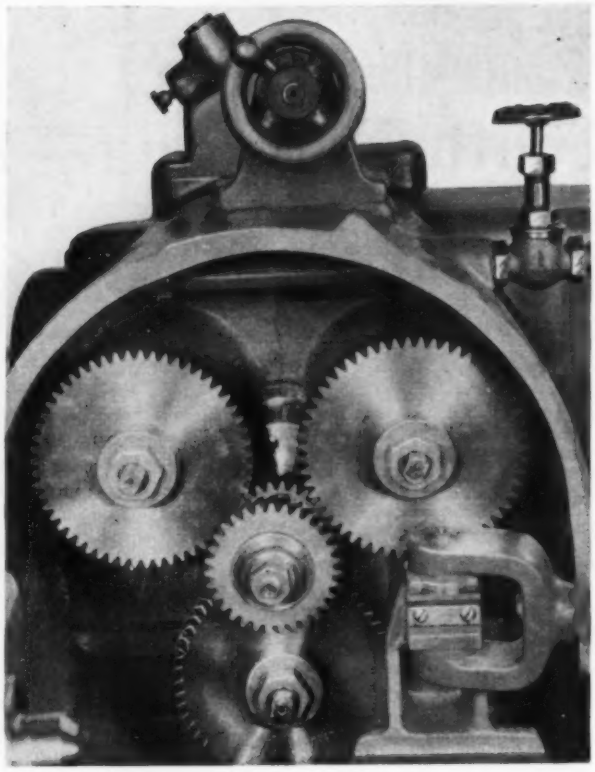
Needless to say this is not a high production shop, but one where the best possible results are desired, if not always obtained. Its management is by no means oblivious to the advantages of uniform production. Machines and gears are constantly being checked to eliminate errors. Having eliminated as many errors as can be done with the best commercial practices, gears are matched to secure the greatest perfection in tooth bearing. Without some kind of control, however, depending on the matching of gears might become an unsatisfactory practice.

It has been the experience of the plant in question that a ground gear may have a variety of small imperfections that produce noise. In some cases ground gear teeth seem to have infinitesimal flats that are noisy when run with a similar gear. By mating such a gear with one ground on another machine, much better results are secured. Even with the best of ground gears it now seems to be considered good practice to lap them as a final operation. A short lapping in a good machine is believed to give gears that run more quietly when subjected to the sound test.

The method of cutting the gears has its effect on the finishing of the teeth, as previously stated. Hobbing and shap-



Spiral bevel gears are lapped on the Gleason machine. The pinion drives the gear and, as they rotate, the position of the gear is changed continuously and automatically, effecting a combined horizontal and vertical movement of the gear relative to the pinion. This secures tooth correction at all points



Close-up view of the Fellows gear lapper used for the Dodge transmission gears. The lapping spindles have fixed center distances but can be set at a slight angle to the work spindle should it be found desirable. The three laps have different numbers of teeth to change the pitch line contact of each. Each lap spindle has a brake to secure the desired pressure on the teeth.

ing do not, it is said, give identical results. This is no reflection on either method as excellent gears can be produced by either one, but the gears cut by each method should receive careful study. Helical gears sometimes present a problem all their own from the tendency to "untwist" or straighten the helix angle during the heat treatment. The change is very slight, however, in the width of face used in the average transmission gear. Any distortion occurring, when careful heat treating methods are used, can be readily corrected by lapping.

How Dodge Finishes Gears

An excellent example of extreme care in making automobile transmission gears was found in the Dodge plant of the Chrysler Corp., this department making the transmission gears for all the Chrysler cars. The different models demand a large output of gears, by mass production methods, yet with the care taken at each step of the process the gears are practically silent. And this result is secured with a minimum of rejections.

While this article deals with the finishing of gears and not with gear making in general, a study of the subject emphasizes the fact that accuracy in the finished product depends to such a large extent on the machining methods that it seems best to give a brief outline of the way in which the gears are handled in the Dodge plant.

The gears are made of SAE 6150 steel with close tolerances as to carbon and alloy content. The sliding gears are broached from the punched hole, careful attention being paid to the large diameter, or space between the splines in the gear. The blanks are held on a mandrel with a slight taper to insure squareness and concentricity, the mandrel bearing on the large diameter of the hole. The teeth are rough cut on hobbing machines and finished on gear shapers. They are inspected 100 per cent by rolling with hardened master gears. Mandrels are watched very carefully, the wear tolerance being but 0.002 in. below the low limit.

The green gears are burnished between hardened master gears which are ground and lapped. Helix angles are checked before and after heat treating, as is the tooth spacing. Eccentricity is checked on the Red Liner. Tooth form is watched closely by testing the first gear cut with a new or with a sharpened cutter, before production is allowed to proceed.

Lapping is done on the Fellows machine using laps made of a close-grained cast iron. Three laps are used, all having the same outside diameter but each having a different number of teeth. The laps are run at fixed center distances, the number of teeth varying with the gear being lapped. A 25-tooth gear, for example, uses laps having 54, 55 and 56 teeth, the middle gear being the normal gear for that diameter of gear blank.

The gear being lapped is given an end motion while it rotates, the gear being driven by the machine and driving the laps. Brakes on each lap spindle enable a load to be thrown on each lap, in either direction of rotation. By varying the end motion with reference to the rotations different lapping action is secured which makes it possible to put the tooth bearing at any portion of the tooth and to correct slight inaccuracies that may develop in heat treatment. The laps can be worn to a knife edge at the point of the teeth and still retain the correct form to produce silent running gears. The laps are very carefully made, the hole and both sides being ground before the teeth are cut to insure concentricity and prevent wabble.

The lapping compound used is made by putting 3 qt. of carborundum F F F abrasive in 3 gal. of a special oil that, while being readily pumped, holds the abrasive in suspension for 24 hr., even when not in circulation.

Although lapping as practiced at the Dodge plant removes from one to three "tenths," it should be considered rather as a refining of the surface finish than as a corrector of poor tooth form or spacing. For while there are cases, in other shops, where this method has been used in salvaging gears by removing several thousandths, economy and good practice demand the best workmanship from the gear blank to the finished gear.

As a means of locating the cause of any variation from the high standard set, each gear is stamped with the date on which it was made. Then, should trouble develop later, the steel used, the heat treatment and other operations can be investigated. In this way the causes of error can be determined in the least possible time.

Are Open Front Dies Weak?

H. R. HAGEMAN

Since several concerns manufacturing die sets have apparently standardized the open front design in which the leader pins are set back of the die-steel space, it seems pertinent to inquire if that design is really better than that in which the pins are set in diagonally opposite corners of the shoe. My own experience and observation led me to believe that the single advantage of the former design, that of leaving the front unobstructed for work, is more than offset by the briefness of the operating time before the pins lose their effectiveness through wear, and that when set diagonally, pins and bushings which are considerably worn are of more value for aligning a punch and die than are snug fitting ones which are set off to one side.

• IDEAS FROM PRACTICAL MEN

An Unusual Press Job

JOHN J. MC HENRY

The part *A*, Fig 1, is of ⅛-in. hot-rolled steel and is made in a press, being designed to replace a casting on which the machining cost was excessive.

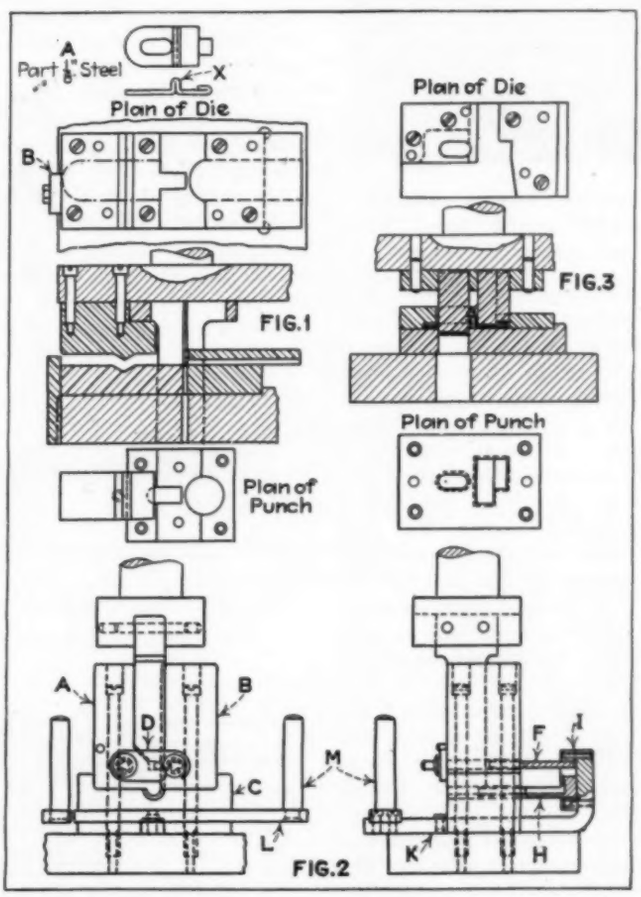
The first operation, Fig 1, consists of cutting and preliminary forming. The shape to be formed was developed to maintain sufficient rigidity to resist the pressure required to curl the tongue by the method shown in Fig. 2 before the bend collapsed. In this breaking down or bending operation, the bending parts of the tools are so located that the corners of the bend in the piece will coincide with the corners when the part *X* is folded in the finished form. The cutting-off tools trim the ends of the piece to the required shape. In this operation, the strip stock is fed far enough for the end to be trimmed and is then advanced to the stop *B*, after which the press is run continuously for the full length of the strip.

The second operation, Fig 2, consists of curling the tongue and sizing the folded section. The punch is machined to correspond to the semicircular end of the piece and 0.003 in. deeper than its thickness, thus housing the piece completely up to the point where the folding starts. The contact of the semicircular part of the piece with the recess of the same shape in the punch, provides the best possible condition to prevent burring and upsetting, and also insures centralization of the piece.

The die members consist of the blocks *A*, *B* and *C* and the latch *D*. Block *A* backs up the punch, provides for the location of the folded section and contains the form over which the tongue is curled. Block *B* contacts with the lower part of block *A*, and in its inner face is a channel 0.128 in. deep and 1-¼ in. wide, providing a nest into which the piece is placed. Block *C* confines blocks *A* and *B* and has a groove in which the tongue is curled. The knockout arrangement consists of the knockout pins *F* and *H;* the knockout retainer *I;* the sliding bar *K;* the cross member *L;* and the handles *M*. The knockout pin *F* contacts with the folded part of the piece, while the one at *H* contacts with the curled tongue.

In operation, with the ram at the top of the stroke, the piece is placed in position between the blocks *A* and *B*, the latch *D* is closed and the press is tripped. Immediately following the contact of the punch with the piece, the tongue, requiring but little pressure, curls first, the end contacting with the curling block when the half circle has been completed, leaving but one unsupported section of the piece—that of the first bend. This section then collapses and is formed to size. To remove the part, the latch *D* is opened and the knockout pins are brought forward by the handles.

The tools for the last operation, Fig. 3, pierce the elongated hole and collapse and size the curled tongue. In the plan view of the die is shown the nesting arrangement. The sectional view shows the punch at the bottom of the stroke, the elongated hole pierced and the curled tongue collapsed and sized.



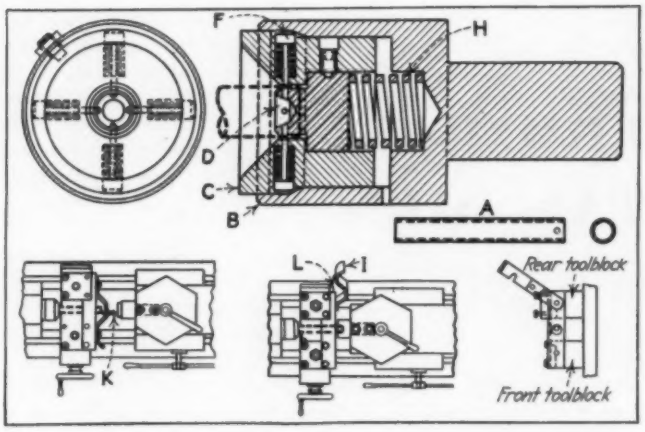
Making a close fold in the center and curling the end required unusual dies, and took three operations

Piercing in a Screw Machine

EMIL WITTMANN

We had to cut off and pierce a large quantity of pieces of thin brass tubing like the one shown at *A*. After the pieces had been cut off in the screw machine they were sent to the press department to have four small holes pierced near one end. By an accident, the press tools were broken, and in order to expedite matters and to cheapen the cost of production, it was suggested that the piercing might be done in the screw machine prior to the cutting-off operation. Accordingly, the tool illustrated was made.

The tool consists of the hollow body



This tool was used to punch radial holes in thin brass tubing by utilizing turret movement

B terminating in a shank to fit the turret; the sliding member *C;* the horn die *D;* the four radial punches *F,* together with their springs; and the stiff spring *H*. The horn die and the four radial punches are contained in the sliding member. Attached to the rear toolblock is the pivoted stop *I* having the adjustable stop screw *K*. The angle iron *L* is attached to the front and rear toolblocks and has a hole large enough to admit the tube and to permit the toolblocks to travel far enough for the cut-off tool to do its work without interference. This angle iron also acts as a stop for the sliding member *C* as the turret is moved forward.

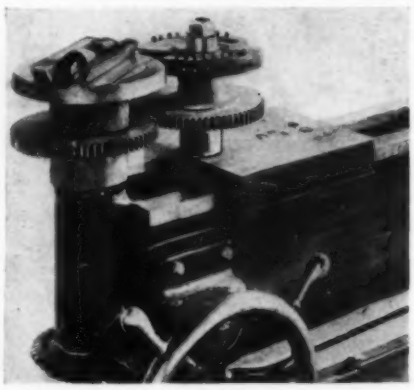
In operation, the tube is fed against the stop screw *K* and the stop *I* is then swung up out of the way. When the turret is brought forward and the sliding member contacts with the angle iron, continued movement of the turret brings the tapered part of the bore of the tool body into contact with the heads of the four radial punches, forcing the punches inward against the pressure of their springs and piercing the tube. As the turret is backed away, all movable parts of the tool are returned to their normal positions by their springs. The taper bores in the die and in the front of the sliding member permit the escape of the slugs. Cutting off the piece from the length of tubing completes the operation.

Machine for Rolling Numbers in Graduated Cylindrical Parts

A. E. GRANVILLE

There are many methods of stamping numbers in graduated parts, both cylindrical and flat. In some cases the numbering is done by hand, using steel stamps and a hammer. In other cases the numbers are pressed in by various fixtures or machines. Where any amount of such work is done, the hand method is unsatisfactory because it is subject to mistakes and generally results in uneven or distorted figures.

A company making work requiring graduating and numbering on the periphery has made the very simple, accurate and easily operated machine illustrated for rolling in the figures. The graduations extend about one-third only around the work and are to be numbered from 10 to 40 on each side of zero. The work is mounted on the vertical spindle at the left, and the numbers, or stamps, are held by setscrews in the turret on the spindle at the right. The stamps are similar to those used, in hand stamping, except that the shanks are round and shorter, and that each stamp except the zero has two figures on its face. Nine stamps are used, zero being placed in the center and the numbers 10, 20, 30 and 40 are on each side of it.



A simple machine stamps numbers on graduated round bases by means of removable stamps

The two vertical spindles are set the correct distance apart by moving the slide carrying the turret, care being taken to have the gear teeth (which are multiples of the graduations) meshed so as to bring the numbers and the graduations in correct relation. The number 40 is carefully lined up with the end graduation as the other adjustments are made. The numbers are then rolled in the work by turning the pilot wheel in the foreground, which is connected to the work carrying spindle by bevel gears. Since less than one-half the circumference of the work is graduated and numbered, the teeth in the gears connecting the two spindles need be cut less than half way around. For numbering work of another diameter, the other parts of the gears can have teeth at a different pitch diameter. For this purpose the turret carrying the stamps is double, segments of different diameters being diametrically opposite.

Broaching in the Lathe

F. SERVER

There are times in the operation of a job shop when the ability to find a way to get out a product cheaply and without additional equipment is of prime importance. In the case of broaching, the accompanying illustrations show what a lathe can be made to do.

An attachment for broaching small holes is shown in Fig 1. To the small faceplate *A* is attached the similar plate *B* having a bronze nut held in its hub by a pointed setscrew. The long screw for pulling the broach is supported in the bracket *C* and traverses in one direction or another according to whether the spindle is revolved forward or backward. To the outer end of the screw is attached the head for holding the broach. The bracket *D* supports the broach and has a plug, or plate, for locating and holding the work on the outer end of its hub. Both brackets have bars attached to the sides of their hubs, and the head for holding the broach has side lugs slidably engaging the bars. This means is employed to counteract the tendency of the head to rotate by friction imparted to the screw

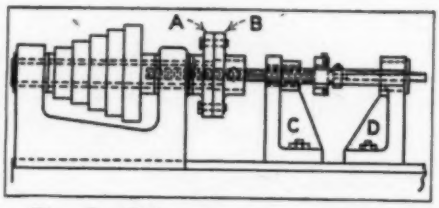


Fig. 1—Using a nut on a lathe faceplate to pull a broach

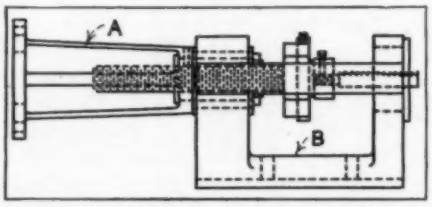


Fig. 2—Extending the nut when broach is too large to go through spindle

by the revolving nut. The back gears are engaged, so that the spindle revolves slowly. A lathe having a comparatively large hole through the spindle should be selected.

In Fig. 2 is shown broaching of large holes in a lathe having a small hole through the spindle. Instead of the plate carrying the bronze nut, as in Fig. 1, the casting *A* is attached to the faceplate, and the brackets *C* and *D* are replaced by the one-piece bracket *B* having two uprights. The outer end of casting *A* is supported in a bearing in the left-hand upright of the bracket and carries a bronze nut for the screw that pulls the broach. The arrangement of the other parts is substantially the same as in Fig. 1. The principal advantages of this device over the one shown in Fig 1 are that it is a self-contained unit, easily put in place on the lathe; that it can be used on a lathe having a small hole through the spindle; and that the screw is larger in diameter and more sturdy.

Fixture for Bending Flat Copper Bars

ANDREW BEUSCH

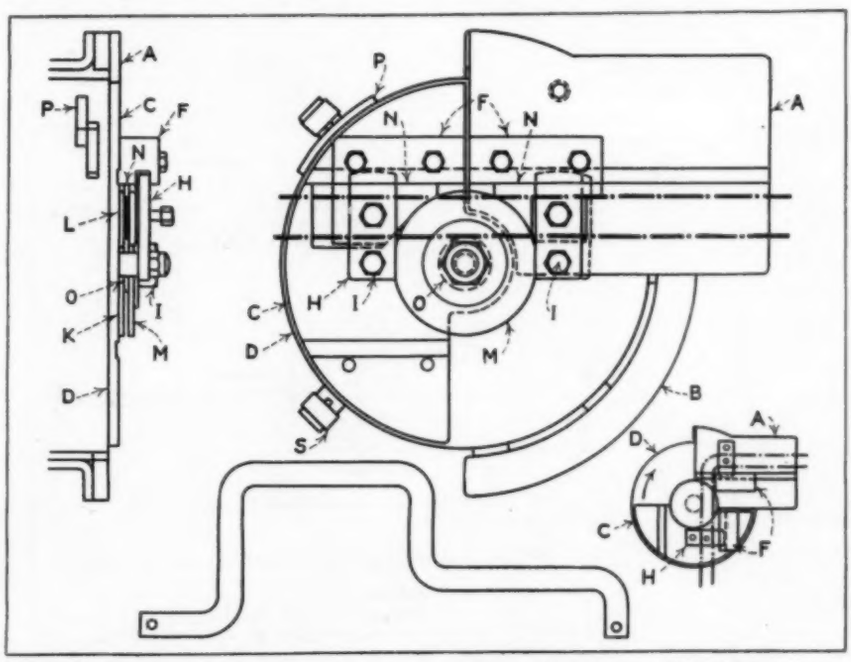
The fixture illustrated is used for bending flat copper bars, 3x8x6 in., edgewise. It is mounted on a vertical boring mill which furnishes the power to do the bending.

Plate *A* is stationary and is attached to the bed of the machine by means of the half-ring *B* and several brackets. Plate *C* is secured to the table of the machine. Keyways are put in both plates to locate the blocks *F*, and clamps *H*, are pivoted on the studs *I*. When the bar to be bent is placed in the fixture, the clamps are open so that it can be laid on the circular plate *K* and the flat plate *L*. The upper plate *M* is then placed over the central stud and is fastened by a nut. Then the clamps are swung into position and tightened, holding the bar tightly on the stationary plate, and loosely on the revolving plate, so that the free end can slide. The bar is held against the collar *O* and between the plates *K* and *M* by the spacers

In operation, the machine is started by a push button on the housings and the table turns in a counterclockwise direction, so that the bar is bent around the collar *O*. Bending continues until the cam *P* contacts with the button on switch *S*, at which time the machine stops. The clamps are then loosened and the bent bar is removed. Then the table is rotated in the reverse direction to the starting position, where it is stopped by the cam contacting with another switch, not shown.

This process makes a very smooth bend, since the plates *K* and *M* confine the inner edge of the bar between them and prevent it from bulging around the inner radius. The metal flows toward the outer radius, where it is stretched. In this way the original thickness of the bar is preserved for about two-thirds of its width. Collar *O* can be changed for other collars of different diameters for making bends of various radii.

The view in the lower right-hand corner of the illustration shows a set-up for a secondary bend on the same bar. Here the clamps have been moved to different locations and the bending is done by rotating the table in a clockwise direction. A bar bent in both set-ups may be seen in the lower part of the illustration.



Flat copper bars for conductors are bent edgewise in this fixture. Suitable guides hold the bars flat and prevent buckling at corners

SEEN AND HEARD

JOHN R. GODFREY

Specifications and Inspectors

Ignorance and errors cost us a lot of money every year. Ignorance as to what materials to use and what tolerances to give are both expensive. Two recent cases were interesting. A high priced bronze that was hard to cut gave place to yellow brass with excellent results and saved money. Specifications for an axle to carry a roller bearing race demanded a lapped seat, twice as long as the race and with a four-decimal radius that was nothing but an "air fit." The inspector was allowed no discretion and could not have used any if he had been allowed to do so. A really practical inspector can save a lot of money for all concerned.

Bronze Valve Seats in Aero Engines

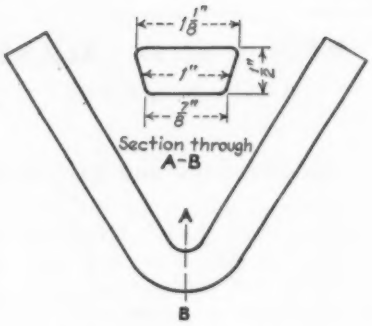
My note on shrinking valve seats in engine cylinders or cylinder blocks calls forth the comment that steel inserts in aluminum cylinder heads of aero engines will cause trouble because of the great difference in expansion. The critic is 100 per cent right. But he must have read "steel" into the paragraph because I didn't mention it. Also other engines with seats in aluminum heads all use bronze and not steel. Several automobile builders are now putting steel inserts in the exhaust valve seats, freezing the insert with dry ice or liquid air, the expansion holding them firmly in place. This practice still further increases the life of motors.

Cast Forming Dies

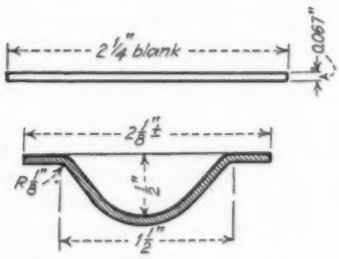
Foundrymen are waking up to the possibilities of improved castings not only to save business that is slipping but to regain some that has already departed. One such instance is the use of chromium and molybdenum in steel castings for forming dies. These dies can be cast so nearly to size and shape that but little machining is necessary. And one concern making steel wheels has used such dies on over 250,000 stampings. With results like this, castings may well replace the builtup steel dies now used in many kinds of work.

Press Work Pressures

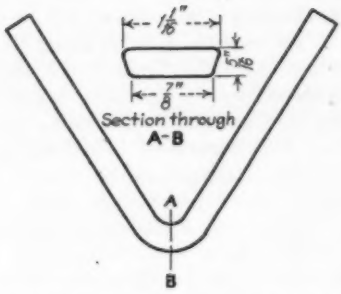
Series IX — *Forming*



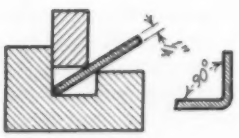
Material--Machine steel, 1/2 in. thick by 1 in. wide
Operation--Formed into shape as shown
Pressure--20,000 lb.



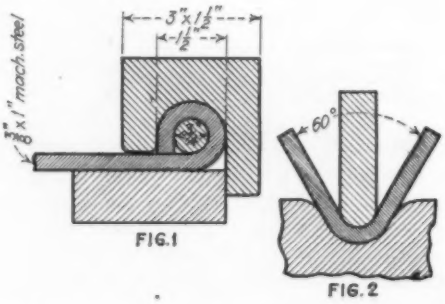
Material--Soft steel, 0.067 in. thick
Operation--Formed cold
Pressure--5 tons
Blank was held rather lightly, allowing the flange to wrinkle slightly



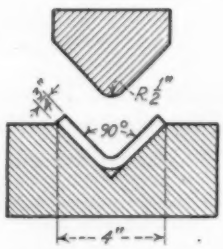
Material--Machine steel, 5/16 in. thick by 1 in. wide
Operation--Formed cold
Pressure--8,000 lb.



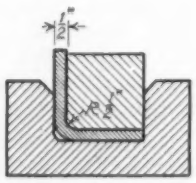
Material--Machine steel, 1/4 in. thick,
A. 1 in. wide B. 2 in. wide
C. 3 in. wide
Operation--Formed to 90 deg. angle
Pressure--A. 19,000 lb. B. 26,000 lb.
C. 35,000 lb.



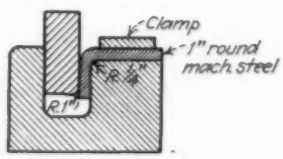
Material--Machine steel, 3/8 in. by 1 in.
Operation--Formed as shown in Figs. 1 and 2
Pressure--Fig. 1-30,000 lb. without applying extra pressure. To set the work down hard, a pressure of 40,000 lb. was used
Fig. 2-9,800 lb.



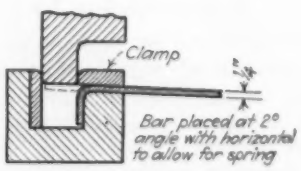
Material--Cold rolled machine steel, 3/4 in. in diameter
Operation--Formed to 90 deg. angle
Pressure--7,000 lb.



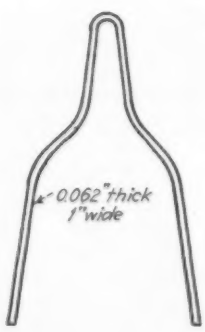
Material--Machine steel, 1/2 in. thick by 1 in. wide
Operation--Formed as shown
Pressure--26,000 lb.



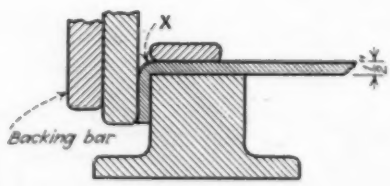
Material--Machine steel, 1 in. round
Operation--Formed cold
Pressure--12,600 lb.



Material--Machine steel, 1/4 in. thick,
A. 1 in. wide B. 2 in. wide
C. 3 in. wide
Operation--Bent as shown
Pressure--A. 4,000 lb. B. 6,800 lb.
C. 10,500 lb.



Material--Sheet steel, 0.062 in. thick by 1 in. wide
Operation--Formed cold
Pressure--3,000 lb.

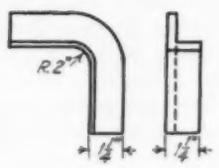


Material--Machine steel, 1/2 in. thick by 3 in. wide
Operation--Bent 90 deg.
Pressure--22,000 lb. to form cold
50,000 lb. to flatten at X

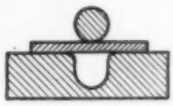
Contributed by C. W. LUCAS © *American Machinist*

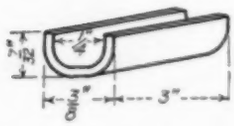
Press Work Pressures

Series IX — *Forming*

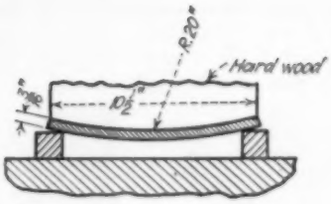


Material--Angle iron, 1-1/4 by 1-1/4 in., 1/8 in. thick
Operation--Bent into shape shown. Outside web did not rupture
Pressure--8,000 lb.

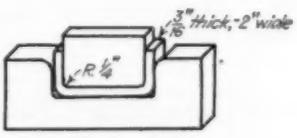




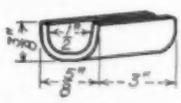
Material--Sheet steel, 1/16 in. thick
Operation--A piece 3 in. long shaped as shown
Pressure--4,600 lb.



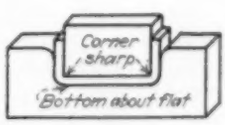
Material--Machine steel. 3/16 in. thick by 6 in. wide
Operation--Bent cold
Pressure--4,000 lb.



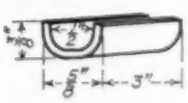
Material--Machine steel, 3/16 in. thick by 2 in. wide
Operation--Formed cold
Pressure--20,000 lb.



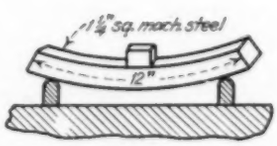
Material--Sheet steel, 1/16 in. thick
Operation--A piece 3 in. long shaped as shown
Pressure--2,800 lb.



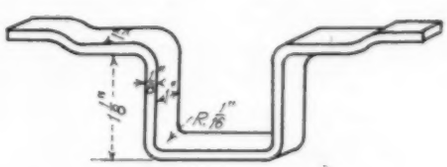
Material--Machine steel, 3/16 in. thick by 2 in. wide
Operation--Formed with sharp corners. Bottom about flat. Work done cold
Pressure--25,000 lb.



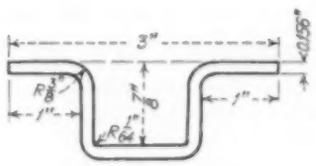
Material--Machine steel, 0.079 in. thick
Operation--A piece 3 in. long shaped as shown
Pressure--3,600 lb.



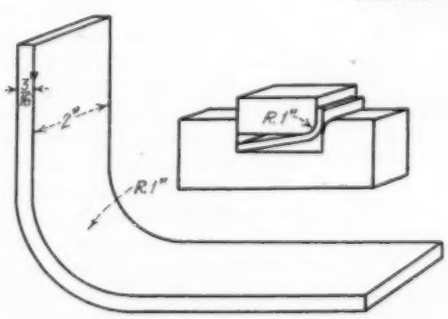
Material--Machine steel, 1-1/4 in. square
Operation--Formed with a set of 1/8 in.
Pressure--8,500 lb.



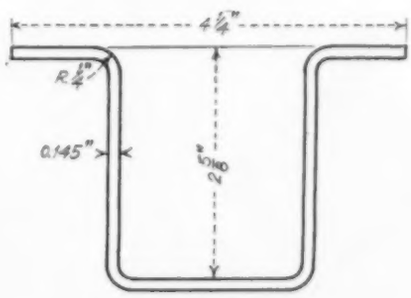
Material--Machine steel, 1/8 in. thick by 1 in. wide
Operation--Formed cold
Pressure--30,000 lb.



Material--Steel, 0.156 in. thick
Operation--Shaped cold
Pressure--6 tons per lineal inch



Material--Machine steel, 3/16 in. thick by 2 in. wide
Operation--Bent as shown
Pressure--5,000 lb.
Strip 1 in. wide required 2,500 lb.



Material--Low carbon soft steel, 0.145 in. thick
Operation--Shaped as shown
Pressure--21,000 lb. to start the bend
46,000 lb. to finish bend

Contributed by C. W. LUCAS — © *American Machinist*

SHOP EQUIPMENT NEWS

Lewis No. 8-C Automatic Wire Straightening and Cutting Machine

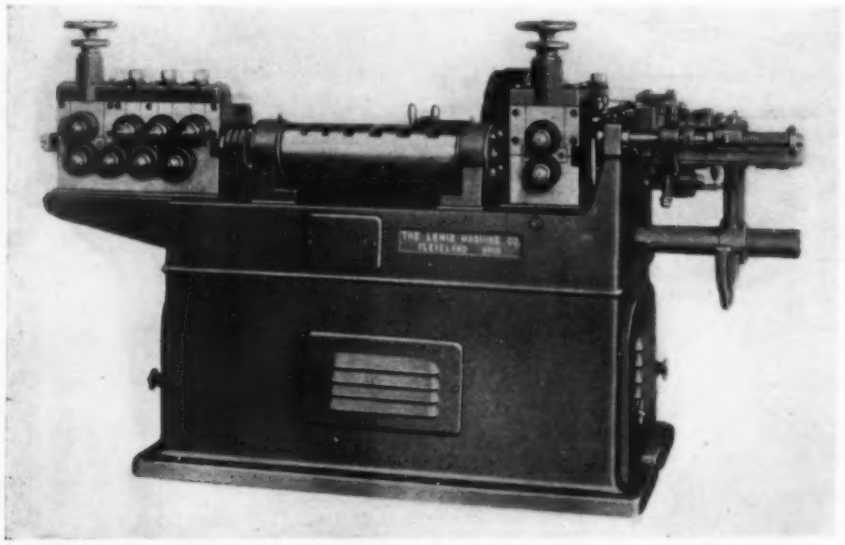
Redesign of its automatic wire straightening and cutting machine by the Lewis Machine Co., 1592-1600 E. 24th St., Cleveland, Ohio, has resulted in a machine that incloses all drive gears in oil housings, and uses feed and flywheel transmissions for production work and cutting of short lengths. The drive is so designed that all gears and bearings in each housing are lubricated by splash. The wire is cut by a quick-action cam and lever. Only a small fraction of a revolution of the flywheel is required for cutting, thereby leaving the remainder of the revolution for feeding the wire through the machine. The short cutoff time minimizes marking or swelling of the wire.

The machine is available with four or six roll straighteners ahead of the rotary straightener. The lower straightener rolls are power-driven and each upper roll has a separate adjustment, the last or leveling roll lining the wire up with the center of the arbor. A set of feed rolls is furnished ahead of the straightener rolls to feed the wire. The entire front feed housing assembly is arranged for vertical adjustment to allow for roller wear.

The straightener arbor, flywheel and other continuously running shafts are mounted on Timken roller bearings. All drive gears as well as the clutch striker plate and key are made of alloy steel, heat-treated. The motor is mounted in a closed base and is connected directly to the straightener arbor and intermediate driveshaft by V-belt drive. An improved guide bar mechanism is furnished for handling the wire as it is being cut. The shutter is timed to open with the knife, thus preventing sagging of the cut piece, and assuring a square cut end on each wire with minimum burr. A combination gage wire stop and release mechanism releases the wire as it is being cut, and leaves it free to drop out of the guide bar. This prevents wedging of the cut piece between the end of the cutoff die and the stop.

The machine is suited for cutting lengths under 20 in., such as welding rod and special bolts. When slow feeds are required for very accurate work on high-carbon wire, it is necessary to shift a lever to the slow feed. Medium and high feeds are readily available for the general run of work, particularly commercially straight work. Lengths under 20 in. may be run without using the clutch by simply selecting the proper flywheel speed with the flywheel transmission, during the low section or dwell of the cutoff cam. This makes it possible to cut over 100 short rods per minute without excessive wear.

Capacity of the machine is $\frac{3}{8}$ in. high carbon or $\frac{7}{16}$ in. mild steel down to $\frac{3}{32}$ in. mild steel. A 15-hp., 1200-r.p.m. motor furnishes drive. Shipping weight is approximately 4,200 lb.



Particularly suited for cutting lengths under 20 in. in $\frac{3}{8}$ in. high carbon or 7/16 in. mild steel wire as a maximum, the Lewis No. 8-C Automatic Straightening and Cutting Machine has been redesigned to inclose all gears in oil housings and incorporate anti-friction bearings

Sampson Hand Bending Machine

A universal hand bending machine has been placed on the market by the Sampson Tool Co., Inc., 101 Walker St., New York, N. Y. This machine will bend flats, rounds, squares, angles, T's, profile iron and also tubing to practically any desired angle down to 60 deg., hot or cold. When bending cold it will handle the following material: flat bars, $2\frac{1}{2}$x$\frac{5}{8}$ in., $3\frac{1}{2}$x$\frac{1}{4}$ in., and 4x$\frac{5}{8}$ in.; rounds, $\frac{3}{8}$ in.; squares, $\frac{3}{8}$ in.; angles, $2\frac{3}{4}$x$\frac{5}{8}$ in.; tees, $1\frac{1}{2}$x$\frac{5}{8}$ in.; and tubing up to $\frac{3}{4}$ in. When bending hot the machine will handle material as follows: flat bars, $3\frac{1}{2}$x$\frac{5}{8}$ in.; rounds, $1\frac{5}{8}$ in.; squares, $1\frac{3}{8}$ in.; angles, $3\frac{1}{2}$x$\frac{5}{8}$ in. and tubing up to 1 in. For the bending of squares, angles, tees to round, obtuse or acute angles, special dies are provided.

The machine can be set up very quickly. The tool is operated by a short hand lever and ratchet but can be used without the ratchet when bending light gage materials. Bending block are of hardened steel and can be interchanged. The normal bending block is held by four set screws, and eight different positions can be obtained. It is thus possible to bend shapes and squares of every size down to $1\frac{3}{4}$ in. length of side.

Cincinnati Wide Range Divider

The Cincinnati Milling Machine Company, Cincinnati, Ohio, has announced a "Wide Range Divider" for use with its universal dividing heads for rapidly selecting divisions from 2 to 400,000 and any angle in degrees, minutes and seconds. Any of the divisions or angles can be made or obtained with the dividing head spindle set at any angle from 10 deg. below the horizontal to 50 deg. beyond the vertical, for example, when cutting bevel gears. Spiral gears can also be indexed.

This arrangement is a compact, self-contained unit built into the dividing head and consists of the large index plate *A*, sector and crank *B*, together with a small index plate *C*, and sector and crank *D*. The mechanism is so arranged that small crank *D* operates through a reduction gearing of 100 to 1 ratio inclosed in the housing *G*. Ratio between the dividing head worm shaft and spindle is 40 to 1.

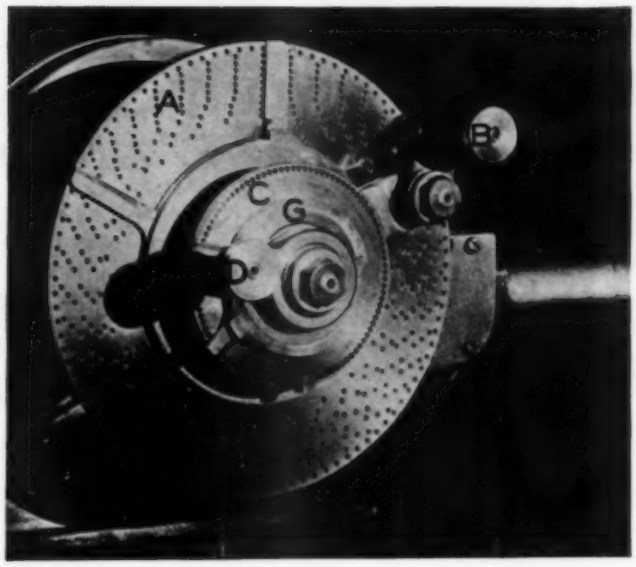
This divider can be set up for universal indexing in the conventional manner by utilizing the crank *B* only, in combination with the proper hole circle on the large plate. Large plate is drilled on both sides and contains eleven hole circles on each side for taking care of the many divisions ordinarily obtained by universal indexing, the operation being the same as it has been heretofore on the standard Cincinnati universal dividing head.

When the number of divisions required cannot be obtained by conventional indexing method, for example, 67 divisions, then the Wide Range Divider is employed as follows:

1. Any of the hole circles on the large plate can be used with small plate, but it is recommended that the 100-hole circle on the above plate be used, because it simplifies the required calculations. Therefore, using the 100-hole circle on large plate *A*, 100-hole circle on small plate *C*, and with a ratio between dividing head worm shaft and spindle of 40 to 1, one hole space selected on the small plate, causes the spindle to turn $\frac{1}{100} \times \frac{1}{100} \times \frac{1}{40} = \frac{1}{400{,}000}$ of one revolution.

2. Divide 400,000 by the number of divisions desired, namely—67. The result gives you a whole number quotient and a fraction—5970—10/67. Should the quotient be a five-digit number, the first number represents the number of full turns of crank "B."

3. Set sector on large index plate *A* 59 spaces on the 100-hole circle, 59 being the first two whole numbers of the quotient obtained.



Divisions from 2 to 400,000 and any angle to seconds can be secured by combination of the Cincinnati Wide Range Divider and the company's universal milling head. Dividing heads now installed can be fitted with the wide range divider

4. Set the sector on the small index plate *C* 70 spaces, 70 being the last two whole numbers of the quotient obtained.

5. Index crank *B* an amount equal to the sector setting, namely—59 spaces.

6. Then index crank *D* an amount equal to the sector setting, namely—70 spaces. (Both cranks are moved in the same direction.)

7. Compensate for fraction 10/67 to the right of the last two whole numbers of the quotient obtained by adding one space to the index movement of the small crank *D* at intervals equal to the nearest whole number obtained by dividing 1 by 10/67. The result of this division is 7. Therefore, every seventh division, index 71 spaces on the small plate *C* instead of 70. In this way 9 of the 10 spaces of the fraction are picked up. One space is lost, but the resulting error is only equal to 0.0000942 in. on a 12 in. circle.

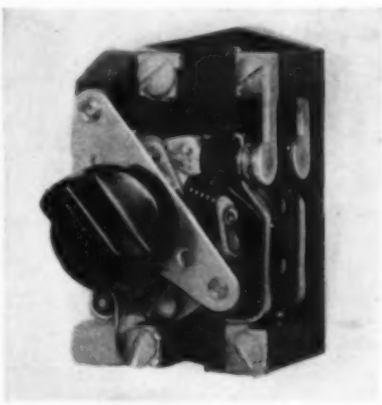
The ability to select any desired angle in degrees, minutes or seconds is a valuable feature in the toolroom for spacing keyways and slots or when boring holes in angular relation to each other. The 54-hole circle in the large plate *A* and 100-hole circle in the small plate *C* are employed. One turn of the large crank *B* equals 9 deg., one space on the 54-hole circle equals 10 min., one space on the small plate *C* equals 0.1 min. or 6 sec. Ten spaces on the small plate equal 1 min.

"Rennite" Cutting Alloy

A cutting alloy known as "Rennite" is being distributed in the United States by B. A. Field, 505-507 Orange St., Newark, N. J. The tungsten content of this alloy is understood to be exceptionally high. The alloy is fusion welded to special steel shanks in a variety of tool shapes. Tests of the material have given the following results: On 3 per cent nickel casehardening steel, 35 tons tensile strength, 153 Brinell hardness, a rough turning speed of 170 ft. per min. was secured on bars and 128 ft. per min. on castings. On cast iron of 29.6 tons compressive strength and a Brinell hardness of 180, a rough turning speed of 128 ft. per min. was obtained. "J.B.R." tipped tools possessing lesser qualities are also distributed by the above person.

General Electric Starting Switch for Fractional-Hp. Motors

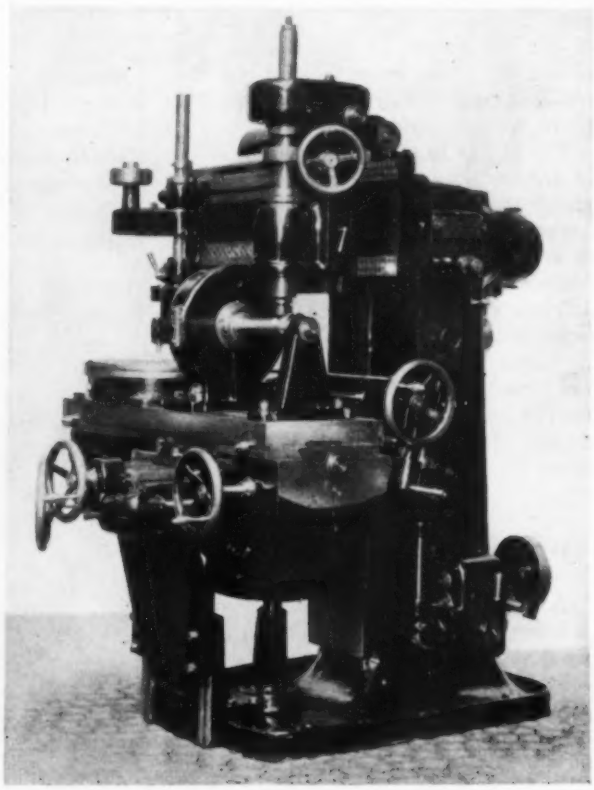
Protection against stalled-rotor current and injurious overload conditions is provided by a small, hand-operated starting switch developed for fractional-horsepower motors by the General Electric Co., Schenectady, N. Y. The switch is for use with either single-phase a.c. or d.c. motors. The a.c. switch is available in single- and double-pole forms. Designated as Type CR-1061,



the switch has been made available in several forms as follows: Open type for applications where the purchaser wishes to provide his own enclosure; enclosed-type for general purpose applications; and switches for Class I, Group D hazardous locations. The switch affords the following features: complete overload protection, a positive snap-action mechanism which is trip-free.

Curd-Nube Automatic Universal Vertical Copying Machine

The Curd-Nube Machine Co., 117 W. Lake St., Chicago, Ill., is now placing on the market in the United States the No. KF-3 vertical copying machine suitable for cutting dies and cams from an enlarged or original copy. The machine can be arranged for cutting face-cams with the aid of one circular table when an enlarged pattern is employed, or the machine can be arranged for cutting such work with a special apparatus that is placed beside the circular table. The milling spindle and tracer are mounted on the horizontal slide, and are adjusted independently of each other, either horizontal or vertically, by handwheels. Face-cams up to 20 in. in diameter may be cut in a 1-1 ratio, but enlarged patterns up to 50 in. in diameter can be employed. Longitudinal and cross automatic feeds are fitted to the table which is controlled by stops.



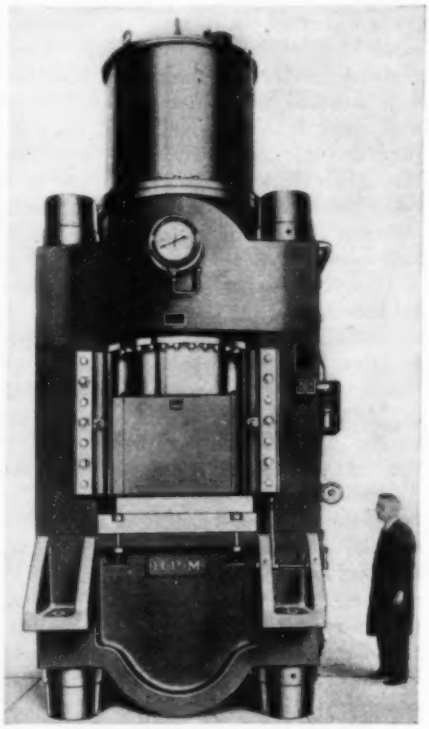
Face-cams and dies can be cut in a 1-1 ratio or from an enlarged pattern on the Curd-Nube Model KF-3 Automatic Universal Vertical Copying Machine

"H.P.M." Heavy-Duty Production Stamping Press

The Hydraulic Press Mfg. Co., Mt. Gilead, Ohio, has developed a hydraulic press for sheet-metal stamping, forming, embossing and similar die work. The press is entirely self-contained with the direct electric motor-driven pump mounted across the rear of the press head. An overhead tank contains the supply of oil employed as the pressure fluid and lubricant. No accumulators are required.

Operating flexibility is attained with the various controls supplied, which include automatic adjustable pressure regulation, and variable stroke and die shut height. The pressing cycle may be carried out in complete automatic sequence, making either single strokes or running continuously. Two-hand electric push-button starting is a standard feature. An emergency reverse button is included. When desired, the automatic cycle control may be cut out and all press movements controlled manually through a hand lever that governs the speed as well as the direction of ram travel.

The heavy-duty press frame has massive box-type uprights with forged steel tierods shrunk in place. These tierods are pre-stressed so that a 50 per cent overload will not produce stretch. The slide is guided at each corner by long gibs adjustable front and back. These gibs are provided to assure accurate alignment of the punch and die, but do not take side thrust. The bed is a steel casting of deep section. It is designed with a factor of safety of 15. Pressure capacity of the press shown is

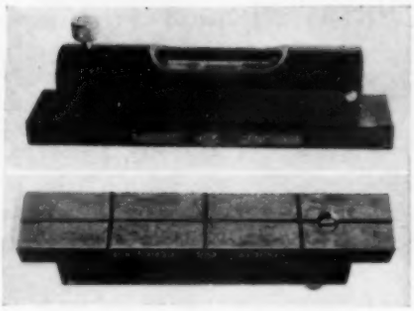


Self-contained oil supply and operating flexibility are featured in the "H.P.M." Heavy-Duty Production Stamping Press made in sizes from 100 to 2,000 tons

1,500 tons. The bolster plate measures 48x48 in., the slide, 40x40 in.; maximum opening, 18 in.; maximum travel, 12 in.; minimum shut height, 6 in. The press is built in a series of standard sizes and pressures ranging from 100 to 2,000 tons.

Société Genevoise High-Precision Level

A high-precision level, reading to 5 seconds of arc per division, has been placed on the market in the United States by the R. Y. Ferner Co., Investment Bldg., Washington, D. C., for the Société Genevoise d'Instruments de

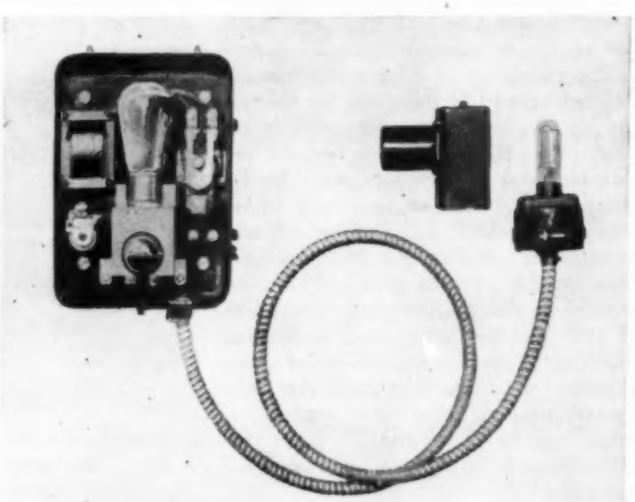


Société Genevoise High Precision Level for shop use. Total capacity, 40 seconds of arc

Physique, Switzerland. The level is adapted for shop use in checking machine tools and high-speed transmissions, setting sine bars on inclined surfaces, leveling baseplates and beds of machinery, and for manufacturing tools and fixtures. The body is of hard steel, machined from the solid, and the base is scraped and provided with cleaning grooves. Length of the base is 6½ in., and the width is 1⅝ in. The level vial is cemented in a brass mounting and is adjustable by means of a knurled screw. This permits setting the vial to zero and also to use the level for slightly tilted surfaces, which is desirable in checking the ways of machine tools that are not exactly leveled. Spacing of the vial divisions is about 0.1 in., and there are four divisions each side of zero so that the total capacity is 40 seconds of arc. Net weight of the level is 2.1 lb.

General Electric General-Purpose Photoelectric Relay

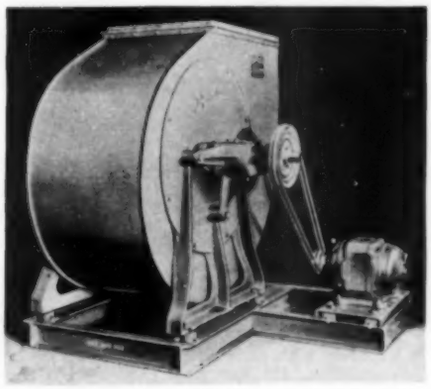
The Type CR7505-A4 improved general-purpose photoelectric relay now being marketed by the General Electric Co., Schenectady, N. Y., affords greater convenience of adjustment. The adjustment knob has been placed in a prominent position on the bracket that supports the tube. Earlier models were designed so that it was necessary to change the wiring connections to cause the relay to function upon the admittance of light when it was wired to operate upon the exclusion of light. A single-pole, double-throw snap switch now eliminates any wiring changes. With the switch in one position, the relay will function when light is admitted, and when the switch is thrown to the other position, the relay will only operate when the light source has been cut off. The relay utilizes the "Pliotron" tube designed for industrial purposes.



Wiring changes are not necessary to cause the General Electric Type CR7505-A4 Photo-Electric Relay to function on admittance or exclusion of light

Buffalo Silent Floating Base for Fans

To provide an inexpensive means of insulating a fan and its driving motor from building foundations, the Buffalo Forge Co., Buffalo, N. Y., developed the silent floating base illustrated. Flexible rubber insulators that prevent metal contact between the holding-down bolts and the fan provide a damping effect. The rubber used in these insulators is in shear rather than in compression.



Eklind Universal Milling Head

A high-speed universal milling head designed for use as an attachment for milling machines has been developed by the Eklind Tool & Manufacturing Co., 649 West Washington Blvd., Chicago, Ill. The device is satisfactory for such operations as routing, engraving, filing, grinding and finishing on molds, dies and metal patterns. The head may be swiveled to any angle and clamped rigidly in position. It is possible to follow plaster of paris molds by clamping the mold to the table of the milling machine and then feeding the table with respect to a stationary finger which projects into the mold and which may be fastened to the bed of the milling machine.

Various operations on dies, molds and metal patterns can be done with the Eklind Universal Milling Head

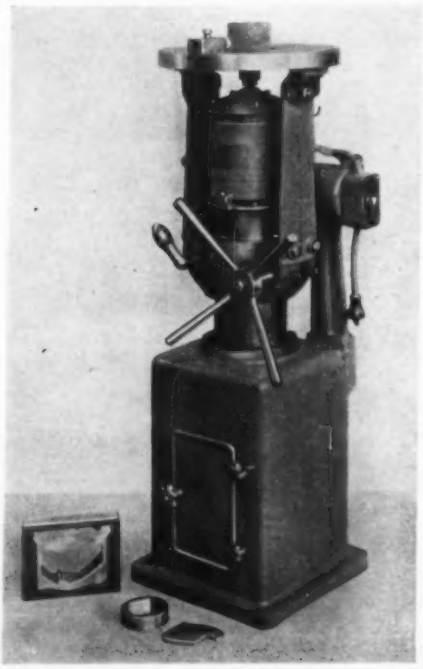
Mechanical features of the milling head are:

1. Motor may be swung for use on either right or left side.
2. Double ball thrust bearing on draw screw for tightening or releasing collet.
3. Pin furnished for locking spindle when tightening collet; locking the motor switch at the same time.
4. A full-length steel sleeve holds SKF spindle bearings in alignment.
5. Expansion and contraction of spindle is possible without jamming.
6. V-belt drive.
7. Ball bearing motor.
8. Hardened and ground tool steel spindle and collet of special design to eliminate cutter slippage.

A lighting circuit may be the source of power for the milling head, which is equipped with a single-phase, 60-cycle, ⅛-hp. motor, running at a speed of 1,725 r.p.m.

Baker Contour Grinder

Baker Bros., Inc., Toledo, Ohio, have developed a grinder for producing accurate contours or irregular shapes. The vertical wheel spindle is driven from a vertically mounted motor, and the armature of the motor reciprocates. This reciprocating action is obtained by an independent motor instantly controlled. This action is secured by means of a cam mounted directly below the spindle and driven by a small motor. The table can be tilted at any desired angle in relation to the wheel for angle grinding.



Vertical wheel reciprocation of 3/16 in. and maximum wheel face width of 2 in. indicate capacity of the Baker Contour Grinder

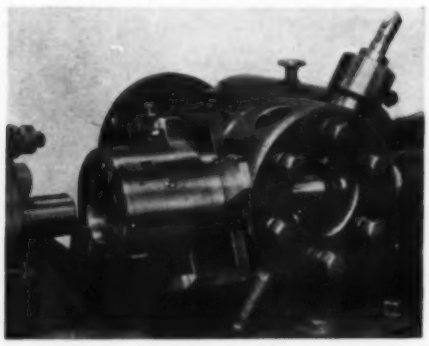
Furthermore, the table is "in the clear" and the size of the work is not limited. A diamond dresser with a diamond-mounted nib is furnished as standard equipment. This attachment is quickly mounted on a T-slot in the table, and with the wheel rotating in a fixed position the table carrying the dresser is moved up and down through means of a capstan handle. This method of dressing insures wheels square with the table.

No change is necessary for internal or external grinding, as the work is simply lifted over the wheel for internal grinding, and pressed against it for external grinding. The work being done is visible at all times to the operator. A radius grinding attachment is of value in grinding convex radii on the end of a rectangular or square section stock, or special tool bits. Angle setting of the table allows for grinding an angle on the radius. The piece to be ground is clamped in the workholder block and the radius is ground by rotating it by means of an operating handle. Two adjustable stops are provided at each side of the fixture to allow grinding of the arc to different degrees.

Specifications: Size No. 2, arbor diameter and length (the fit in collet) 12x7/8 in.; wheel capacity; 1/2 to 4 in.; face of wheel, 2 in.; diameter of hole in cup wheels to fit arbor, 1/2 in.; taper on spindle, No. 1 Morse; diameter of table, 15 in.; angle setting of table each side of center, 10 deg.; total reciprocation movement of spindle, 7/8 in.; maximum distance of table to floor, 45 in.; minimum, 40 in. Weight, 350 lb.

H&G Self-Opening Diehead for No. 2 B&S Screw Machines

The Eastern Machine Screw Corp., Truman & Barclay Sts., New Haven, Conn., has developed an "H&G" self-opening diehead for the No. 2 Brown & Sharpe automatic screw machines to permit threading up to 1 in. in diameter by 2 in. long in both coarse and fine pitches. The clearance of the machine has heretofore been the limiting factor on the size of the diehead and has made

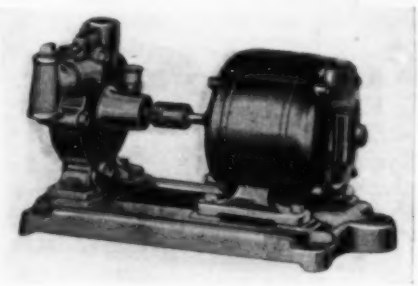


it impossible to use a diehead of the size mentioned, but the company has recently been able to design one without sacrificing strength.

The possibility of using a self-opening diehead instead of solid dies for threading up to 1 in. provides several advantages. Higher cutting speeds are possible, and the chasers may be resharpened. It is not necessary to reverse the spindle for backing off and this makes possible the following savings: Elimination of wear on the machine from shock of reversal; elimination of the time previously lost in backing off the thread; elimination of torn threads from backing off; and the usual reverse may be used as a second forward speed. The diehead takes the same chasers as used in all 1-in. H&G dieheads.

"RCW" Type T Turbine Pump

Roots-Connersville-Wilbraham, Connersville, Ind., have developed the Type T regenerative turbine pump for handling from 5 to 300 gal. per min. at heads up to 350 ft. The pump employs a patented taper-edge impeller which



makes it possible to vary the quantity while the pump is running. Suction and discharge openings are both located in the main pump housing to facilitate disassembly for cleaning without disturbing the pipe connections. Impellers are made of bronze in the standard pumps with a seal-type packing gland on both sides, thus keeping lubricant out of the impeller channel. The pumps are readily built in special alloys.

"O.K. Jr." Round Die Screw Plates

The Greenfield Tap & Die Corp., Greenfield, Mass., has recently placed on the market a line of low-priced "O.K. Jr." round die screw plates, consisting of twenty different sets of commonly used taps and dies in size ranges 4-36 to 12-24 machine screw and 1/8 to 3/4 in. The dies are adjustable and are held in the stock by three tapered screws. Each set is furnished in a hardwood box. Simplified design is said to make the low price possible.

Greenfield No. 3100 Jr. Screw Plate Set particularly adapted to automotive use

Attached directly to the dieholder, the "Dickerman" Hitch Feed provides stock feed of 1/64 to 2 in.; takes widths of ⅛ to 2½ in.; thicknesses of 0.005 to 0.125 in.

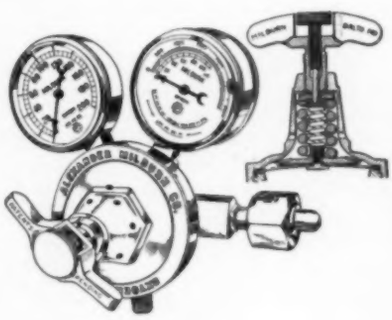
Dickerman Hitch Feed for Power Presses

The Producto Machine Co., Bridgeport, Conn., is now sales agent for the "Dickerman Hitch Feed" that is attached to the die-holder of any type of die set rather than applying it to the power press itself. The hitch feed is a low-priced apparatus that consists of an operating cam attached to the punch holder and a feeding mechanism attached to the die set base. On the downward stroke of the press the cam rides on a hardened roller and stud which forces the feed slide back. On the upward stroke of the press, a release spring functions so that the stock is pushed through the die to the required stroke. The feed is adapted to all types of presses having a 2 in. stroke and can be placed on the die set in any position for any style die. Stock can be fed both from strips or reels and the length of feed is adjustable from 1/64th to 2 in. Stock thicknesses handled range from 0.005 to 0.125 in. in thousandths. The widths of stock range from ⅛ to 2½ in.

The exact length of feed is determined from an adjusting nut as shown. Hardened gripper plates are used for actually feeding the stock, one plate holding the stock for backing up and the other plate for performing the operation of feeding the stock the required distance. The spring control affords the required power for pulling the stock from the reel or strip. The hitch feed is a permanent fixture and is of advantage on short-run jobs. Three operating cams have different angles: No. 1 for 2 in. and under, No. 2 for 1¾ in. and under and No. 3 for 1¼ in. and under. One operating cam is supplied.

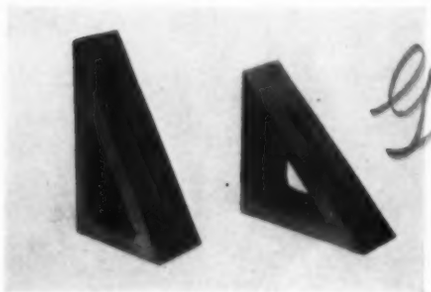
Milburn Micrometer-Adjustment Regulator

The Alexander Milburn Co., 1416-1428 W. Baltimore St., Baltimore, Md., has developed a regulator for use with oxygen, acetylene and other gases. Two compression springs, one within the other, operate a removable metal diaphragm. The main key operates the heavy spring, and the micrometer adjustment key a fine bronze spring that enables the operator to secure pressures from zero to 5 lb., in addition to the adjustment obtained with the standard adjustment key. The regulator is sensitive for the finer pressures necessary for low-pressure torches and small torches doing fine work and requiring close adjustment.



Van Keuren 45- and 60-Deg. Shop Triangles

Cast-iron shop triangles are now available from the Van Keuren Co., 12 Copeland St., Watertown, Mass. The triangles are provided with slots in each face for bolting them together, fastening parts or clamping to the machine. All faces and angles are ground. In the sizes shown the 60 deg. triangle is approximately 3 in. in base, width, 5 in. in height and 1½ in. in thickness, while the 45 deg. angle is 3⅞ in. in base width 3⅞ in. in height and 1½ in. in thickness. These triangles facilitate measurement or production of parts that have 30 deg., 45 deg., 60 and 90 deg. angles, or multiples or combinations thereof. Like pairs of 45 deg. or 60 deg. triangles make adjustable parallels. Other combinations include equilateral triangles, squares, rectangles and parallelograms.



"Stackbin" Stacking Tray

The Stackbin Corp., Providence, R. I., has developed an inexpensive type of stacking tray designed for storage of parts or finished products. Each tray is made so that one fits into another of the same size. Trays can be stacked

to any convenient height. The construction is similar to that of a sectional bookcase. Ends of the tray are formed to provide a guide or channel by means of which the upper tray can slide backwards or forwards on the lower one. These channels make a natural handle for grasping the tray. By the use of these trays, a sizable stock can be stored on the work bench or on the floor, convenient to the place the operator stands.

• PATENTS •

MAY 16, 1933

Metal-Working Machinery

Control for Machine Tools. Edward P. Burrell and George W. Drake, Cleveland Heights, Ohio, assigned to The Warner & Swasey Co., Patent 1,908,885.

Tapping Machine. Gilbert H. Hageman, Dayton, Ohio, assigned to Delco-Products Corp. Patent 1,909,055.

Gear Testing Machine. Oliver F. Bauer, Rochester, N. Y., assigned to Gleason Works. Patent 1,909,088.

Building up of Machine Tools, Specially Grinding Machines. Carl Krug, Frankfort-on-the-Main, Germany. Patent 1,909,110.

Spindle Construction for Machine Tools. Ernest J. Svenson, Rockford, Ill., assigned to Sundstrand Machine Tool Co. Patent 1,909,135.

Hydraulic Control Mechanism for a Machine Tool. Samuel T. Webster, Worcester, Mass., assigned to Arter Grinding Machine Co. Patent 1,909,-155.

Hydraulic Operating System for a Machine Tool. Edward P. Burrell, Shaker Heights, Ohio, assigned to The Warner & Swasey Co. Patent 1,909,-165.

Hydraulic Operating System for Machine Tools. Edward P. Burrell, Shaker Heights, Ohio, assigned to The Warner & Swasey Co. Patent 1,909,166.

Gear Grinder and the Like. Orlando Garrison, deceased, Dayton, Ohio, assigned to Pratt & Whitney Co. Patent 1,909,398.

Lathe. James G. Collins, Kalamazoo, Mich., assigned to Atlas Press Co. Patent 1,909,522.

Machine Tool Organization. Joseph B. Armitage, Wauwatosa, Wis., assigned to Kearney & Trecker Corp. Patent 1,909,564.

Metal Sawing Machine. John S. Toohey and Malcolm E. Erskine, Racine, Wis., assigned to Raine Tool & Machine Co. Patent 1,909,598.

Rotary Grinding Machine. Edward B. Gardner, Big Rapids, Mich., assigned to Hanchett Manufacturing Co. Patent 1,909,614.

Machine Tool. Albert M. Johnson and Walter M. Fairbairn, Rockford, Ill., assigned to Barnes Drill Co. Patent 1,909,766.

Machine Tool. Albert M. Johnson and Walter M. Fairbairn, Rockford, Ill., assigned to Barnes Drill Co. Patent 1,909,767.

Machine for Forming Gears and the Like. Friederich Muller, Elizabeth, N. J., assigned to The Whitney Mfg. Co. Patent 1,909,840.

Tools and Attachments

Thread Cutting Attachment and Machine. Fred W. Garrison, Millville, N. J., assigned to Whitall-Tatum Co. Patent 1,908,974.

Lathe Chuck. Herman Casler, Canastota, N. Y. Patent 1,909,658.

Workholder for Machine Tools. Paul S. Jackson, Rockford, Ill., assigned to Sundstrand Machine Tool Co. Patent 1,909,681.

MAY 23, 1933

Metal-Working Machinery

Grinding Machine. Richard A. Heald, Worcester, Mass., assigned to The Heald Machine Co. Patent 1,909,953.

Slotting Attachment for Spindle Machines. Hugh M. Hunter, Cleveland, Ohio, and Cyrus Houghton Hoisington, Windsor, Vt., assigned to The National Acme Co. Patent 1,910,167.

Apparatus for Machine Rolls for Rolling Mills and the Like. Hans Schimmel, Komotau, Czechoslavakia. Patent 1,910,308.

Drop Hammer. Frederick C. Billings, Hartford, Conn., assigned to The Billings & Spencer Company. Patent 1,910,314.

Lathe Carriage Apron Mechanism. William G. Hoelscher, Norwood, and Albert E. Robinson, Cincinnati, Ohio, assigned to The American Tool Works Co. Patent 1,910,334.

Equalizing Head for Broaching Machines. Carl J. Halborg, Detroit, Mich. assigned to Colonial Tool Co. Patent 1,910,388.

Metal Working Press. Edward V. Crane, Brooklyn, N. Y., assigned to Marquette Tool & Mfg. Co. Patent 1,910,523.

Metal Working Power Press. Rudolph W. Glasner, Chicago, Ill. Patent 1,910,-534.

Machine Tool. Henry M. Svebelius, Evanston, Ill., assigned to Michigan Tool Co. Patent 1,910,649.

Fluid Operated Control for Multi-Spindle Drills. Ralph M. Lovejoy, Boston, Mass. Patent 1,911,025.

Drilling Machine. Glen Macomber, Waukesha, Wis., assigned to The Oilgear Co. Patent 1,911,132.

Drilling Machine. Donald Clute and Lester Sterling, Detroit, Mich., assigned to The Oilgear Co. Patent 1,911,138.

Tools and Attachments

Tool Retainer. Carroll R. Alden, Detroit, Mich., assigned to Whitman & Barnes, Inc. Patent 1,910,275.

Method of and Device for Forming Cutting Tools. Ernest Wildhaber, Rochester, N. Y. Patent 1,910,730.

• TRADE PUBLICATIONS •

BURS. Mill-cut, hand-cut and file-cut burs in many different shapes and sizes for work on steel, non-ferrous metals and none-metallic materials are described in a booklet "Keller Burs" issued by the Pratt & Whitney Co., Keller Division, Hartford, Conn. The burs are shown being used in flexible shaft equipment and in machine spindles for various types of finishing.

HEATING ELEMENTS & UNITS. Electric heating elements and units of the strip type are described and the various sizes and capacities are listed in Leaflet TB 30, issued by Harold E. Trent Co., 618-640 N. 54th St. at Poplar, Philadelphia, Pa.

INTERCHANGEABLE COUNTERBORES. Catalog CT-233, just mailed by the Continental Division, Ex-cell-O Aircraft & Tool Corp., 1220 Oakman Blvd., Detroit, Mich., covers standard straight and taper shank holders, stop collar holders and adjustable length holders. Taper drive holders are also illustrated, being different from the Continental drive type. Counterbore holders sets and special-operation tools are included.

PROGRESS IN STEEL. Planned with particular reference to "A Century of Progress Exposition," the Inland Steel Co., First National Bank Bldg., Chicago, Ill., has published a book that shows the development of the company as the Central West developed, gives in lay language an explanation of steel production of value to steel buyers, and illustrates the diversification of the application of steel in the modern world.

STAINLESS STEELS. The Allegheny Steel Co., Brackenridge, Pa., has issued a folder on "Fabrication of Allegheny Stainless Steels" covering recommended procedure for the three groups of steels. —austenitic, martensitic and ferritic steels. Information is given on the various types for welding, annealing, pickling, sandblasting, shearing, blanking and punching, forming and drawing, spinning, riveting and brazing.